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PRACTICE OF MEDICINE

HYGIENE AND SURGERY

A PRACTICAL TREATISE FOR THE USE OF

FAMILIES, TRAVELERS, SEAMEN, MINERS, AND OTHERS

EDITED BY

FREDERICK A. CASTLE, M.D.

IN TWO VOLUMES

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Acute Infectious Diseases.

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THE ACUTE INFECTIOUS DISEASES.

THERE is a class of diseases especially characterized by their rapid dissemination by contact; by the intensity or virulence of their manifestations, and by the comparative shortness of their duration. With these characteristics, this class of diseases is appropriately grouped under the title of the Acute Infectious Diseases.

The course and conduct of these diseases in the body resemble, to some extent, the action of poisons; hence they are often called "blood-poisoning" or *septic* (σηπτος, putrid) diseases.

The poison, whatever its nature, once introduced, in however small quantity, into the blood, so swiftly induces manifestations of disease in the whole body as to resemble the action of a yeast or ferment, a little of which "leaveneth the whole lump," and hence these diseases are also called the *zymotic* (ζύμη, ferment) diseases.

Finally, because these diseases, under the unfavorable hygienic conditions which still surround us, are able to spread over whole sections of country—over whole countries—indeed, unless checked by natural causes, over the whole globe, they constitute what are known everywhere as the *epidemic* or pandemic diseases.

Types of these diseases are Asiatic cholera, small-pox, chicken-pox, measles, scarlet fever, typhus and typhoid fevers, and diphtheria. In the very fore-front of the acute infectious diseases stands, or stood (for our improved sanitary conditions, faulty as they still are, have prevented its development in modern times), that most terrible of all scourges to man—the plague. At the extreme opposite end of the list we may read mumps, whooping-cough, and influenza (a pronounced sample of which, "the epizoötic" of 1873, confined nearly every horse of this country to his stall for several days); and along the column, at different places, erysipelas, child-bed fever, and dysentery, when epidemic, as in ships, hospitals, and camps; the so-called pyæmia and septicæmia, blood-poisonings which supervene upon abscesses and wounds; with vaccinia, hydrophobia, malignant pustule (charbon), and snake-bites, etc.,

as poisons communicated from animals to man; and finally, the cattle-plague as a typical example of this class of affections in the lower animals themselves.

The characteristic feature of all these diseases is infection. It matters not that they are not all alike propagated by immediate, direct, or personal contact. In some diseases the contagious element is fixed close to the body affected, or is attached to objects once in contact with the body. This is the case in the eruptive diseases proper—small-pox, measles, or scarlet fever, for instance. In other diseases the poison is more volatile; it is dissipated from the body and disseminated to greater distance through the air, as in cholera and yellow fever. In still other cases, as in typhoid fever, dysentery, and cholera again, it is the dejections, the discharges from the intestinal canal, which chiefly convey the contagium, to finally infect the soil, and through the soil or sewage canals, by filtration to great distances, the drinking-water of our wells and cisterns and running streams. To breathe infected air, or drink infected water, though distant from the focus of infection, suffice to engender cholera, dysentery, or typhoid fever; while the contagion of syphilis, and probably of diphtheria, must be lodged upon the mucous membranes; and vaccinia, hydrophobia, malignant pustule, the virus from venomous animals, to produce infection, must be inoculated into the very blood itself.

But, even in cases of widest dissemination, the regular advance of the disease may always be strictly observed. The contagious element of cholera, for instance, the most widespread of all the epidemic diseases of our times, may not overleap at a bound great expanses of land or water. The ocean, which carried from the new hemisphere to the old new twigs and leaves of plants, to excite in the mind of Columbus suspicions of the existence of other lands, was for all time an impassable barrier to this disease, until it was directly conveyed across in the memorable year of 1832. There must be intervening centres of infection, if there be not direct transportation, to effect the spread of infectious disease.

The advocates of spontaneous (autochthonous) development or origin of infectious disease become fewer every year. So far as those diseases are concerned whose cause can be most distinctly traced—cholera and yellow fever, for instance—the line of infection, when accurately pursued, is always found to correspond with the line of transportation by water or rail. The increased velocity of travel in our day, with the correspondingly increased swiftness of transportation of disease, is the embarrassing element in tracing the course of disease to its original seat. A week and two days may now suffice to introduce from Europe to our whole country a

sweeping epidemic of cholera, and, under favorable conditions, but a few days are required to carry yellow fever from New Orleans to New York. Thus the advanced knowledge of sanitary science in our day, to which we may chiefly ascribe our comparative exemption from the devastating epidemics of ancient times, is counteracted to some extent by the increased facilities for transportation of disease to new centres, the absence of which alone saved the human race in the middle ages from almost utter extinction.

We come now to consider the cause of acute infectious disease.

The ancients had but little difficulty with this momentous question. The origin of epidemic disease was easily explained by the crude superstitions attached to celestial phenomena, or by the fatuous assertions of theosophy. The sudden appearance of a comet was an omen of direst import, whose significance was only fully revealed by a coincident or subsequent plague. An eclipse of the sun inevitably portended evils as diabolical as diverse. Even as late as the end of the seventeenth century, an edict was actually published by the Elector of Darmstadt, in protection against the mischief entailed by a solar eclipse*: Or the misconduct of a people or ruler excited the vengeance of an irate god, who vented his displeasure—in the peradventural absence of sufficient redemption—in famine and fire and plague. Lebert informs us that in India it was a popular belief that the prevention of human sacrifices had excited the anger of the gods, and relates, in proof, the story of the wife of a Hindoo, in Palcala, who resorted to every device to obtain permission to violate the law by being burned upon the grave of her husband, who had died of cholera. She maintained that she had done the same thing four times already in previous states of existence, and that if she might repeat it now for the fifth time, the cholera would cease in fourteen days. The rajah at last gave his consent; but the ashes of the poor fanatic, it is needless to state, did not assuage the disease, which continued just the same in its work of desolation. A timely earthquake or volcano, an inundating tidal wave, a violent storm, have been repeatedly brought into service in explanation

* "His Highness having been informed that on Wednesday morning next, at ten o'clock, a very dangerous eclipse of the sun will take place, orders that on the day previous, and for a few days thereafter, all cattle be kept housed . . . . . , and the cellars and garrets of houses guarded, so that the atmosphere may not obtain lodgment and thus produce infection, because such eclipses frequently occasion whooping-cough, epilepsy, measles, paralysis, fever, and other diseases, against which every precaution should be taken."

of the development of epidemic disease. "The wells have been poisoned," was the cry during the plague of Athens, and everywhere since; a formidable uprising of the people having once (1832) been excited in Paris under this belief.

At last it came to be observed that epidemics prevailed entirely independently of any of the causes alleged, and in the meantime great advance had been made in all the natural sciences. Attention was gradually being directed by the chemists to their explanations of fermentation and decomposition: processes considered analogous to those which occur in the body in infectious disease. For many years the theory then prevailed that the acute infectious diseases depended upon the presence in the blood of some fermenting matter, which induced changes in the whole body in the same manner as in the resolution of sugar into alcohol and carbonic acid gas, or as in the resolution of dead animal matter into water, ammonia, and various gases, the products of common decay.

It was at this time that the acute infectious diseases were called "zymotic." And now there developed as a kind of offshoot from physiology, the separate department of biology, a science which had to deal with the lowest forms of animal and vegetable life. Biological studies only became possible, of course, with the perfection of the microscope, as all these forms are far beyond recognition with the naked eye. The theory had long ago been broached, even by the writers of antiquity, that many diseases were due to the entrance into the blood of low organic forms; but such extravagant ideas were entertained regarding these forms as soon to bring the theory into ridicule and disrepute. Liebermeister relates that one writer of the seventeenth century proposed in real earnest that, during the prevalence of epidemic disease, the animals which were regarded as the cause of it, and which, according to the common notion, were said to fly about in the air, something like a cloud of locusts, should be killed by making a great uproar with blowing of trumpets and firing of cannons. "Others described the animals, which were supposed to have the form of moths, as armed with crooked bills and pointed claws." Fantastic figures of them were drawn, and great fires were built in streets and public squares to burn them up. Nearly a century of oblivion thereupon enshrouded the para-

FIGURE 1.—The Torula or yeast-plant, which develops most often in fluids containing sugar, and is essentially the cause of alcoholic fermentation—largely magnified.

sitic theory of infectious disease. What contributed especially to its resurrection, was the discovery that the processes of fermentation and decomposition are not at all chemical, in the ordinary sense of the term, but are entirely vital. Fermentation was found to be dependent upon the development in the fluid of an infinite number of vegetable growths of distinct and definite form, known as the *Torulæ Cerevisiæ:* rounded or ovoid bodies, which multiply with marvellous fecundity, until the process of fermentation is

FIG. 2.

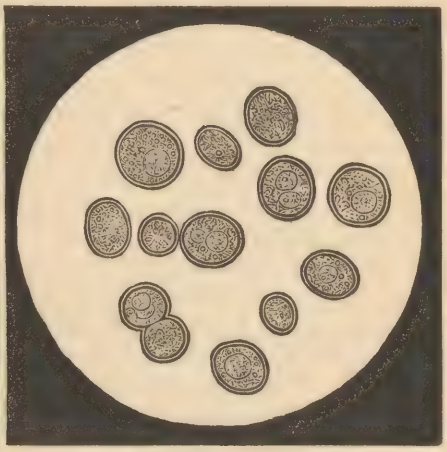


FIG. 3.

FIGURES 2 and 3.—*Saccharomyces Cerevisiæ*, from beer. The first shows the plant during active germination; the second, from a deposit of beer-yeast after fermentation has ceased.

complete, when they gradually sink to the bottom. A minute quantity of these torulæ (yeast) introduced into any saccharine solution, speedily effects its fermentation by their rapid increase in number and size. The process of decomposition likewise de-

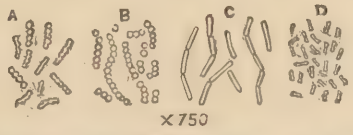


FIGURE 4.—Minute organisms magnified 750 diameters. A. *Bacteria* usually found in stale milk and some other putrefying fluids, where they exhibit very active movements. B. *Micrococci* developing in urine and presumed to cause, by their presence, the conversion of urea into carbonate of ammonia. C. Motionless jointed rods, called *Bacilli*, which develop in infusions of hay. D. Another form of *bacterium* possessing power of active motion, and existing in fluids undergoing putrefaction.

pends upon the rapid multiplication of definite parasites, the so-called *vibrios* and *bacteria* of putrefaction, always present in the air, and when once brought in contact with dead organic

matter, they increase by myriads until entire resolution is brought about.

As the subject stands at present, it must be confessed that the bulk of evidence is in favor of the germ or vital theory of zymosis, that is, that the acute infectious diseases depend upon the presence in the blood of parasites—the lowest forms of life. The question of the animal or vegetable nature of these organisms has lost all interest since it has been conclusively determined that any differentiation between animal and vegetable life is impossible. A great number of observers have already recognized germs in various forms of infectious disease : in cholera, in erysipelas, scarlet fever, childbed fever, diphtheria, and especially in pyæmia and septicæmia, the blood-poisonings referred to, after abcesses and wounds. Peculiar and special forms have been established in different diseases, and, what lends the strongest support to this theory, the inoculation of healthy animals with these special forms engenders the special disease.

Nowhere now, therefore, is there any question of the spontaneous origin of infectious disease. Everywhere is recognized a home where the disease is indigenous, and a route along which it is spread. The mouths of the Ganges and Brahmaputra are the centres of cholera, lower Egypt of the plague, the Antilles of yellow fever, Ireland of typhus. Small-pox first showed itself in Germany in 1493, an importation from the Netherlands, but it was not until 1527 that it was transported to our continent, making its first appearance in Mexico, slaughtering myriads, and then gradually extending over the whole of North America. Scarlet fever, which is first heard of in Arabia, was not seen in our country until 1735. It reached Iceland in 1827, South America in 1829, Greenland in 1847, and Australia in 1848. Measles has not yet been carried to Australia. Cerebro-spinal meningitis, in every respect the most irregular of all epidemic diseases, first fell upon our country in 1806. All this disease, all infectious disease, is of exclusively parental birth.

The parasitic theory is the only theory which reconciles in any kind of harmony the different factors in acute infectious disease. It offers a ready explanation, in the first place, for their *contagion*. The germs, being themselves the elements of the disease, are given off in myriads in every direction in the air or from the infected body.

It is only by reflecting upon the fact that the air swarms at all times with invisible germs—that even the blue of the sky is caused by vast numbers of bodies floating in the atmosphere, so small as to be undistinguishable by a microscope magnifying 15,000 times—

that we may form some adequate conception of the silent, unseen and almost unknown worlds of life about us.

Pettenkofer has recently called attention to the constant agitations in the ocean of air, at the bottom of which we live, even when the motion is not perceptible as wind, as in a crowded room. The constantly rising columns from heated surfaces, from human bodies and gas-lights, the descent of colder air, the currents and counter-currents, make such streams and eddies and miniature

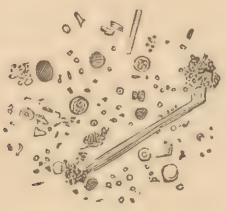


FIGURE 5.

FIGURE 6.

FIGURES 5 and 6.—Particles of dust collected from the air, as they appear when magnified 350 diameters, and consisting of organized bodies resembling those shown in foregoing illustrations, together with amorphous substances.

whirlwinds as would render an audience unable to keep their seats, if they were rendered visible to the naked eye. But how much greater would be our amazement, wonder and distraction—how intolerable, indeed, our existence, if we should also see the myriad hosts of living organisms with which the air is filled.

> "Facevano un tumulto, il qual s'aggira
> Sempre in quell aria senza tempo, tinta
> Come la rena quando il turbo spira."—*Dante.*

But it was flights of fancies like these which first brought the germ-theory into disrepute. These myriad parasites are friends, not enemies to man. Dead organic matter, whether of animal or vegetable origin, would be well-nigh indestructible if all these minute and apparently useless organisms, which are the causes of putrefaction, were themselves destroyed. "Life would be impossible, because the return to earth and air of all that had ceased to live would be suddenly suspended."

The close observation of a long series of years has put us in the possession of most of the data in the natural history of infectious disease. Thus, we have learned first that manifest attack does not follow immediately upon exposure to the disease. There lapses, first, a period during which the disease lies latent in the body, hatching, as it were—the so-called period of incubation. In some cases the length of this period may be determined to a day, by the experiment of inoculation. Thus, the incubation period of

vaccinia is three days ; of small-pox, after inoculation, two days ; without inoculation, twelve to thirteen days ; of scarlet fever, two to seven days ; of typhus, seven to fourteen days ; of typhoid fever, twelve to sixteen days ; of measles, ten days ; of intermittent fever, one to fourteen days ; of syphilis, two to four weeks ; of the plague, two to seven days ; of cholera, two to three days ; of yellow fever, two to nine days ; of hydrophobia, three to sixty days.

Then supervene the various stages characteristic of each disease, each stage of more or less definite duration, marking off a definite phase in the course of each affection. We know, again, what are the infecting structures, what is the period of greatest infection, and what is the duration of infection for each disease.

The parasitic theory best explains also the *swiftness and virulence of the symptoms* of infectious disease. Dallinger and Drysdale describe the development of monads, certain germs, under observation. At first, the normal, almost oval form divides into two, even to the exquisitely delicate hair-like process upon its surface. This was accomplished in six or seven minutes. "At this rate a single form would give rise to a thousand like itself in the course of an hour, to about a million in two hours, and to a number greater than the generally assumed number of human beings now living in the world in three hours." The apparent suddenness of appearance of multitudes of such organisms is thus easily explained. Davaine has calculated that a single bacterian particle would, in the course of twenty-four hours, become the parent of 4,096 such particles ; in forty-eight hours to over 16,700 ; and between the sixtieth and sixty-second hours their numbers reach one to seventy-one trillions. "If each spore, of one species only of the higher fungi, germinated and reproduced its parent, the children would, in the first generation, and in the course of a very few days, form a carpet all over the earth."—(Smith, *Nature*. Aug. 4, 1870, p. 276.)

Thus the swift manifestation and often virulent expression of the symptoms of acute infectious disease correspond to the miraculous fecundity of the parent-germ.

The parasitic theory, again, best explains the *immunity conferred, in the rule, by a single attack* against a repetition of the same disease in the same body. Fermentation having been once effected in a saccharine solution, any further process of this kind becomes impossible. The germs of fermentation have consumed in their development and growth all the matter capable of their nutrition, and additional germs, subsequently introduced, must simply starve to death, or at least remain inert. The tissues—now

recognized as stabile things, not consumed and renewed in the ordinary processes of force and heat-production, as once believed—having furnished to the germs of disease whatever of their nutriment it may have contained, ceases for all time to be capable of nourishing the same kind of germs again. Hence, a repetition of the same disease, if the consumption shall have been complete, is quite impossible. From what has been previously said regarding the arrest of epidemics, it may be readily understood how, in the exceptional cases, other conditions may have arrested the growth of germs before the blood has become entirely impoverished.

Lastly, the parasitic theory best explains the *specificness* of acute infectious disease. Each one of these diseases reproduces itself alone. Measles begets measles, small-pox begets small-pox, cholera begets cholera. Figs would be born of thistles, or grapes of thorns, as soon as cholera of small-pox, or diphtheria of typhoid fever. The introduction into the blood of the specific germ begets the specific disease. In speaking of that typical infectious disease already referred to, malignant pustule (charbon), Pasteur remarks: "So it matters not in what manner the bacteridia (the germs of charbon) be transmitted or transported, they give rise only and in all cases to charbon. We may speak of charbon, therefore, as the disease of the bacteridia, just as trichinosis (the disease from affected pork) is the disease of the trichina, or as scabies (itch) is the disease of its (insect) acarus."

But the parasites or germs do not always multiply in the blood or in the body; hence, not all acute infectious diseases are contagious. Small-pox gives off its contagion from its eruption in greatest virulence just before the vesicle becomes a pustule, in the exhalations from the skin and from the blood, from which even the placenta does not filter it off. In measles the disease may be inoculated with the blood, the tears, and the sputum. Scarlet fever infection is in the exhalations from the skin and lungs, and that of typhus irradiates in every direction from every surface and secretion. These are eminently the contagious diseases. In the case of others, yellow fever, the malarial fevers, cerebro-spinal meningitis, the poison is in the air—is, in no sense, in the body; the germs productive of the disease do not multiply in the blood, nor migrate from it to others about the infected individual. Local colonization, multiplication, and universal dissemination mark the history of the purely contagious diseases; colonization and chemical change characterize those which remain simply infectious.

Whatever theory of the nature of the infectious diseases we may adopt, it is upon our acceptance of their contagion or infec-

tion that we base all hope of their final extermination. The germ-theory offers us, in this respect, the most enticing prospect. It seems now a long way off to the time when Lepidus said to Anthony, "Your serpent is bred now of your mud, by the operation of your sun; so is your crocodile;" to the time when Virgil described how the shepherd Aretæus succeeded in producing swarms of bees from the entrails of a steer exposed for nine days to putrefaction; or, when Van Helmont knew how to generate mice out of some sawdust and an old shirt. And yet, even in our day, we have relics of these views in the advocacy of spontaneous generation of germs, and spontaneous generation of infectious disease.

The recognition of the fact that these diseases are never spontaneous in development, but that their germs are always somewhere in lurk to burst forth when the proper conditions arise, as smouldering embers burst into flames, would protect us in great measure from invasion, or, if attacked, would limit their dissemination to the narrowest possible limits. Pure water, pure air, absolute cleanliness, disinfection, quarantine, and, in proper cases, isolation of the sick, then suggest themselves at once. It is the partial revolution already thus effected by sanitary science which has "changed the type of disease" in our day, for the triumph of modern medicine consists not so much in the cure of the disease in an individual as in the prevention of its attack upon the multitude.

In one of his recent papers Pasteur has remarked: "I think it would be of great interest to multiply researches on this subject, and to compare the organized corpuscles disseminated in the air at one place during different seasons, and at different places at the same time. It appears that our knowledge of contagious diseases, especially at periods when epidemics rage, would be increased by work carried on in this direction."

Here is a suggestion of the highest practical import. We have expenditures of large sums of money by the heads of civilized government everywhere, for purposes of coast survey, for meteorology, and for astronomy—all exceedingly valuable in their way; but for the higher purpose from every point of view, economic as well, of the discovery of the conditions which engender, spread, or check infectious diseases, we are almost entirely dependent upon the unassisted, and, too often, unrecognized or unappreciated labors of individuals.

And yet "all the other mighty casualties of nature, such as earthquakes, volcanic eruptions, mountain avalanches, hurricanes, inundations by sea, have never, in the history of the world, even approximately destroyed as many lives as a single ordinarily ex-

tensive epidemic." The regiments of men mowed down in battle with the modern scientific instruments of death are, in the same war, but handfuls to the holocausts of infectious disease. In peace as in war, these diseases are, though silently, continuously at work. The annual mortality records of any of our larger cities show a frightful percentage of deaths from infectious diseases. In Cincinnati alone—as a sample—they caused 1,975 out of the 5,710 deaths in the year just past. Nearly one-third of all the deaths in this city, statistically one of the healthiest in the United States, during that year—a year without an epidemic—were produced by causes which are, for the most part, in the power of man to prevent. At the head of all preventive measures stands a rigid and relentless quarantine. The most deadly of all the acute infectious diseases, the oriental plague, has been shut off from Europe for so many years, chiefly by the Russian military *cordon*, as to have for us now only historical interest. So the rigid detention of infected vessels in the harbor of New York will render impossible, in that city, a repetition of the yellow fever scenes of the last century. Yellow fever in the epidemic of last year was absolutely locked up in Memphis, where it had lived over from the year before, by relentless quarantine at all the cities of the South. Perhaps the time is not far off when Asiatic cholera may be as effectually blockaded from our entire coast.

After quarantine comes, in proper cases, isolation of the sick, which is, of course, quarantine on a diminutive scale. The history of the disease in Iceland shows that small-pox may be completely stamped out from a country, and compulsory vaccination and revaccination may secure for countries not so fortunately situated the same results.

When an infectious disease may not be prevented, it may be circumscribed to the narrowest possible limits. Our knowledge of the parasiticidal properties of the various disinfecting agents is yet in its infancy, but there is no doubt of the superior value of dry heat in the destruction of disease germs.

Of the various disinfecting drugs, the place in the front rank is still held by carbolic acid. The best is the purest, which is too expensive for extensive use. The penetrating fumes of burning sulphur, or of chlorine, from the chloride of lime, will best disinfect rooms and closets, after their evacuation. Then comes the long array of disinfectants, simple and compound, which are, for the most part, of more value to their proprietors and to the advertising columns of newspapers than to the people at large. And, thus, in brief, do we attempt to combat the acute infectious diseases.

These are the diseases which have decimated armies, disabled

fleets, and extinguished cities, empires, and whole races of men from off the face of the earth, as at Athens, Venice, and Rome. They "have given the death-blow to an advancing civilization, or left a strange and enduring impress upon the intellectual life of great nations." And they are the diseases, as the Registrar-General of England has recently pointed out, which, while they seize the infant from its mother's breast, and do not spare the old man the end of his days, yet vent their direst evils upon maturity in its vigor and prime. They are emphatically the "*morbi populares.*"

THE CONTINUED FEVERS.

Typhoid Fever.

Typhoid fever is the most frequent of all the grave, acute infectious diseases, and is among the most frequent of all diseases. Like all the acute infectious diseases, it spares no age, sex, or condition, though it shows preference for the years of youth and adolescence. Thus, Murchison found that more than half the cases occur between the ages of fifteen and twenty-five, more than one-fourth under fifteen, one-tenth between twenty-five and thirty, after which the liability to the disease rapidly diminishes. But undoubted cases have been recorded as occurring between the ages of seventy and ninety.

Like most of the acute infectious diseases, typoid fever may appear at any place and at any season of the year, though it occurs in our climate in greatest frequency in the month of October, next in November, then in September and August. The smallest number of cases occur in April, next in May, February, and March. Like all the acute infections, one attack secures immunity from others.

Typhoid fever is so called because it resembles, or is like *typhus.* Typhus (τῦφος) is the Greek word for smoke. Scholarly Greeks used the word in a secondary sense to express conceit ("because it clouds or darkens the intellect"), and the old Greek physicians soon adopted it as the best term to express the mental haziness or stupor occasioned by low forms of fever. In fact "typhus," in this sense, was used by Hippocrates. The Germans to this day speak of the *Geistes-umneblung,* the intellectual fogginess of typhoid disease, and such a hold has this name obtained in the course of succeeding centuries as expressing the most obvious sign of the disease, that it will never be substituted until the characteristic germ, causative of it, shall have been definitely discovered and described.

Because of the pre-eminent suffering of the nervous system, the disease has been called *nervous fever* (*Nerven-Fieber*); from its in-

sidiousness and slowness, *nervosa lenta;* because of the local lesion in the intestines (first recognized by Prost in 1804), it has been called *enteric fever*, in exact localization, *ileo-typhus;* and because of its apparent origin from putridity, *pythogenic* (πυθω, *I putrefy*) *fever*, but none of these names possess superiority sufficient to have displaced the old Greek word for smoke and mental clouding.

Typhus and typhoid fevers have, however, nothing more in common, and this they share with all acute infectious disease. Yet for many years they were considered as only different forms or types of the same disease; typhus showing its main expression in an eruption on the skin, and typhoid in an ulceration of the glands in the small intestine. This association of these two diseases has been fatal to a proper understanding of either. Typhus and typhoid fevers are just as different affections as scarlet fever and measles, and the knowledge of this fact, which has only been definitely fixed as such within the last twenty or thirty years, has dissipated much of the obscurity surrounding both affections. For it is now known that each disease is produced by its own poison alone. It is not yet absolutely, perhaps it would be fairer to say even approximately, known what the poison is, but the evidence to the effect that each is *sui generis* is already overwhelming.

The poison of typhoid fever lives in the discharges from the alimentary canal. The alimentary canal is also the avenue by which the disease enters the body in new infection. In the vast majority of cases this avenue is reached by infected drinking water. The dejections (stools) from a typhoid fever patient find their way by percolation through the soil, at a distance, at times, of even two hundred feet, from vaults, sewers, the various receptacles, to cisterns, reservoirs, and running streams feeding houses and communities with water to drink. It is a singular statement to make, but it is generally conceded to be true, that human beings who do not drink, or in some way consume human excrement, seldom suffer from typhoid fever. A few illustrations may suffice to make this statement plain:

In Croydon 400 persons were suddenly attacked with typhoid fever, and all these cases occurred in a quarter supplied with water from a single reservoir. Dr. Carpenter predicted the discovery of the admixture of sewage, which was found to be the case. Purification of the water was followed by immediate cessation of the epidemic. Jaccoud reported to the Paris Academy, during the recent discussion of typhoid fever, the case of a village in Norway in which the disease had been hitherto almost unknown. The village consisted of forty-four houses and contained seven springs of water. An epidemic of typhoid fever broke

out in 1870. Upon investigation it was found that five of the seven springs had been contaminated with excrement. In the thirty-six houses whose 294 inhabitants received their water from the poisoned springs were 121 cases of typhoid fever, while among the thirty-two inhabitants of the remaining eight houses, supplied from the two pure springs, was not a single case.

The same author reported, also, a nearly similar condition of things in the epidemic which broke out in Halle in the same year. Here the impurity of the drinking water was recognized by the taste, and by the presence of microscopic parasites (bacterias and vibriones). From close study of 106 cases, Jaccoud concludes, "the typhogenic [typhoid-causing] poison of feculent matter is absolutely demonstrated."

But it is not the excrementitious matter of itself which communicates the disease. The excrement to be poisonous must contain the poison in it. The excrement is thus merely the vehicle of the poison, else typhoid fever would prevail universally; for only the smallest amount of excrementitious matter is ever conveyed away. It is computed of the city of Munich, for instance, that 150 loads of excrementitious matter accumulate in it every day, and of this amount, on an average, but ten loads are removed. Seven-eighths of it, thus, remain to be drunk up by the soil and to be sunk beyond, and raised to the level of, possible infection of drinking-water, according to the fluctuating level of the subsoil water. In the sewered cities of our own country, the danger of contamination in this way is very much diminished, but this advantage is counteracted, in large measure, by the faulty construction of water-closets, whereby the emanations from the infectious diseases of a whole city are brought into the living rooms, or, as in the often quoted case of the Prince of Wales, into the very bed-chambers of the otherwise best constructed houses.

That excrementitious matter of itself does not engender the disease is proven by the fact that individuals whose avocation is to deal with it are not oftener than others attacked. Thus Dr. Guy compared the past and present condition of ninety-six nightmen (vault cleaners) with about the same number of bricklayers, laborers, and brickmakers, and, after a most critical investigation, concludes: "An examination of the tabulated results must convince the most sceptical that the health of scavengers is fully equal to that of the laboring man with whom they are compared." Mr. Harley, who makes this quotation, says: "This agrees with the observations of M. Parent du Châtelet and others on the health of men who work in sewers," and alludes to the practice of emptying the contents of privies, as manure, over gardens and

fields without injury, other than to their sense of smell, to the inhabitants. He cites, also, from personal observation, two instances where he had known the inhabitants of a house to be exposed for months to the direct emanations, in the one case of a large cesspool, in the other, of a common sewer. "In both cases a leaden pipe, in communication with the water-closets, was carried down inside the house and thence into the sewer or cesspool. After several unsuccessful explorations, it was discovered that rats had eaten a large hole in the pipe leading to the cesspool, and through this aperture the fetid exhalations from its surface arose directly into one of the sitting-rooms and a passage of the building, and on hot and damp days the effluvia were intolerably offensive. The cesspool was emptied at this time, and I witnessed the process. The contents were semi-fluid, of a dirty-black color, and the surface of the pool was covered with large bubbles of gas. Now although several persons were continually exposed to filthy exhalations, in the one case for many months, and in the other for several years, none suffered from diarrhœa or typhoid fever."

If the typhoid-fever poison developed itself in excrementitious matter, the disease would be almost omnipresent, at least would coexist with defective sewage. But this is not the case. It is true that Ireland, a country notoriously defective in sewage, has been almost depopulated by epidemics of typhus and typhoid fever; but it is also true that Brazil, a country equally defective in this regard, and in every other sanitation, baking perpetually, too, under a tropical sun, and reeking with animal and vegetable decomposition, has been singularly exempt from severe epidemics of this disease. The poison of typhoid fever does not develop; it preexists in the excrementitious matter, and is derived from some case of the disease. Hence, matter which does not contain the poison is not infectious.

In his work on the Practice of Medicine, Austin Flint relates the particulars of a case exceedingly instructive in this regard. A little settlement, called North Boston, situated about eighteen miles from Buffalo, consisted, in 1843, the time of the observation, of nine families, all within an area of a hundred rods in diameter: "but the few houses in which the disease occurred were closely grouped together around a tavern, the house farthest from the tavern being only ten rods distant. A stranger from New England, travelling in a stage-coach which passed through this settlement, had been ill for several days, and, on arriving at this stopping-place, was unable to proceed further. He remained at the tavern, and after a few days died. He was seen by several physicians of the vicinity, and there can be no doubt that his disease was the

same as that with which others were subsequently affected. Up to this time typhoid fever had never been known in that neighborhood. The sick stranger was seen by the members of all the families in immediate proximity to the tavern, with a single exception. One family, named Stearns, having quarrelled with the tavern-keeper, had no intercourse with the family of the latter and very little with the other families, all of whom were tenants of the tavern-keeper. No member of Stearns' family saw either the sick stranger or any of those who were taken ill after the stranger's death. Members of the family of the tavern-keeper were the first to become affected; the first case occurring twenty-three days after the arrival of the stranger. Other cases speedily occurred in the surrounding families. In a month more than one-half the population, numbering forty-three, had been affected, and ten had died. Of the families immediately surrounding the tavern, that of Stearns alone escaped; no case occurred in this family.

"The occurrence of the disease produced great excitement in the neighborhood; poisoning was suspected, and Stearns was charged with having poisoned a well used in common by all the families except his own. A fact which encouraged this suspicion was, the common well being owned by the tavern-keeper, he had refused permission to use it to Stearns, who had, in consequence, been obliged to dig a well for his own use." That the disease was typhoid fever is attested by the fact that Dr. Flint made an examination of the body of one of the victims of the disease, and found the characteristic lesions in the intestines. In commenting upon this case, the author observes: "The fact that all the families in which the disease prevailed were supplied with water from a common well, and the fact that the family in which no case occurred did not obtain water from this well, afford ground for suspicion that a virus derived from the excreta was conveyed in the water drank."

But typhoid fever is removed from the category of contagious diseases, strictly speaking (infection by contact with the patient), by the fact that the dejections must be received into the alimentary canal to produce infection. In respect of contagion, there exists, therefore, a most marked difference between typhoid and typhus disease. Typhus fever is most emphatically contagious. Murchison informs us that in Ireland, in 1847, "no less than 500 medical men—about one-fifth of the entire number—suffered from typhus, and of these 127 died, and Griesinger relates that in the Crimean war, at the height of the epidemic among the French, out of 840 attendants in twelve hospitals, 603 were taken sick dur-

ing a period of fifty-seven days, more than eighty surgeons dying of the disease in the course of the campaign." Liebermeister, who makes these statements, adds that Niemeyer in one epidemic was obliged to employ a former criminal, who had just recovered from the disease, as nurse, because all the attendants were sick.

But it is very different with typhoid fever. The physicians, relatives, nurses, attendants, are very seldom attacked with the disease ; that is, they are not more frequently attacked than if not in attendance upon a case. Murchison states that 2,506 cases of typhoid fever were treated in the London Fever Hospital in fourteen and a half years, and in all this time "only eight cases originated in the hospital." Typhoid fever is, therefore, not a contagious disease, and no one need have the least fear of it from simple contact with a patient. It is not the exhalations from the lungs or skin, it is not the clothes or bedding (if clean), it is not the touch and not the odor : it is the *stools* which contain the poison and spread the disease.

To explain the immunity of attack enjoyed by persons in contact with the disease, it was long assumed that the dejections were not infectious from the start, but became infectious later, that the stools, innocent when fresh, in some mysterious way developed the poison, perhaps by allowing time for the multiplication of germs, in the course of a few days after their discharge. But it is far more rational to recognize the lapse of time necessary to secure the introduction of the discharges into the alimentary canal. Moreover, the immediate action of the poison has been demonstrated by direct experiment ; for Letzerich has just reported the effects attending the injection of two rabbits, with a solution (0.5 cc.) of the excreta of a young man who died of the disease two days after the experiment. The animals sickened at once with the symptoms of typhoid fever, and died of the disease, one on the twenty-first, and the other on the forty-eighth day. Post-mortem examinations revealed the changes characteristic of the disease, and revealed, at the same time, the development in myriads, in the blood, in the spleen, the liver, kidneys, and mesenteric glands, of microscopic parasites.

They who have charge of the bed-linen, so often soiled with the discharges, are the persons, above all others, who soonest contract the disease. Hence it is that washerwomen so frequently succumb. A most significant observation is that of De la Harpe, who found that the first series of persons infected by an imported case of typhoid fever were almost always females.

The truth is, the poison of the disease grows feebler with age, and finally dies out altogether. Bouley long ago observed that

when common decomposition commences, the poison of the disease is killed. "The more putrid the odor, the less is the danger of infection." And Chauveau, who has made such brilliant disclosures regarding the germs of analogous infectious diseases, has clearly shown that the common germs of putrefaction are fatal to the germs peculiar to, and causative of, these diseases. It is putrefaction which secures the reduction of all living matter to the mineral state.

But the poison of typhoid fever will long resist destruction under conditions favoring its life. How long, may be seen from the following observation related by v. Gietl:

A villager, who had contracted typhoid fever at Ulm, returned to her native village, a place where typhoid fever had not existed for many years. The excrements of this person were thrown on the dunghill. Several weeks later, five persons were employed to remove this dunghill. Of these five, four were attacked with typhoid fever and one with gastric symptoms and swelling of the spleen. The excrements of these five persons were buried deep in the dunghill. Nine months later, two persons were employed in completely removing this dunghill, and one of the two was attacked and died of the disease.

Cases like this put the question beyond dispute that infection may also occur through the air. But it does not by any means follow of necessity that the infection is effected through the lungs, for the inhaled poisonous particles (liquids, microscopically free of particles, are never infectious) may be easily carried from the passages of the nose and throat, where they adhere for a time, to the stomach and intestinal tube. At any rate, it must be admitted that air as well as water may act as the vehicle of the poison of typhoid fever. Moreover, the poison may enter with still other media than water or air. Widespread epidemics of the disease have originated in England from poisoned milk. Here it is highly probable that the milk was infected by contaminated water used for purposes of dilution. Typhoid fever has been produced also from eating poisoned meat. Some caution must be exercised here, however, in the acceptance of every kind of statement; for some of the cases of so-called typhoid thus produced have turned out to be cases of trichinosis, and others septic poisonings of peculiar nature from mere putridity of meat. Yet the possibility of infection in this way cannot be altogether dismissed as yet. Dr. Walder, of Zürich, reported a most remarkable epidemic as occurring in that place in May, 1878, clearly traceable to eating the flesh of a calf that had died of the disease.

On May 10, 1878, a choral festival was held at Kloten, Canton

Zürich, attended by about seven hundred members of the neighboring choirs. A public breakfast, consisting of veal stew and sausage, took place at 9 A.M. At 3 P.M. there was a somewhat similar repast, with the addition of soup, potatoes, salad, and wine. Water was drunk by only a very few persons, and always mixed with wine. Of those who took part in these meals, five hundred sooner or later fell ill, thirty to forty per cent. on the fifth and sixth days thereafter, and ninety per cent. within the first eight days. Though there was every variety in form, the disease for the most part ran a typical course, and in several of the fatal cases the diagnosis was confirmed by examination after death.

It turned out upon the close investigation to which this case was subjected that the farmer who sold the calf had suffered from typhoid fever, and "during one of the fits of severe diarrhœa, in the first weeks of his illness, he must have passed a motion in the neighborhood of the stall, as during this time he was continually attending to the cattle himself."

What seemed to lend confirmation to this origin of the disease, and to prove the possibility of infection from diseased meat, was a later observation by the same physician, in which a calf was almost certainly infected by a human being. The calf in this case was given to drink of water from a bucket which had been used for washing the viscera of two patients who had died of typhoid fever and on whom a post-mortem had been held. "After an incubative stage of exactly ten days, the calf was taken ill, and, after it was killed, four days later, the pathological changes found were exactly the same as in the other case, and microscopically the calves' intestines in both cases were indistinguishable from a human intestine in the same stage of typhoid fever."

Symptoms.—Typhoid fever is eminently an insidious disease. In typical cases it creeps upon the individual almost without his knowledge. There is a period of general lassitude, a feeling of lack of interest, indifference, apathy. There is a sense of general languor and depression. The patient is everywhere ill at ease, restless, dull, drowsy, but sleepless. What sleep there is does not refresh. This is the period of *malaise*. The work of the day, which may have been hitherto a resource and delight, becomes an aversion, a monotony, a drag. Here is already the envelope of fog or smoke, which so much impressed the old Greek physicians as to give its name to the disease.

An individual is thus exposed to the poison of the disease, and, if susceptible to its action, after a period, varying from a single day to several weeks, begins to experience the prefatory symptoms —the so-called *prodromata*, of the disease. In about ten per

cent. of the cases this stage is absent altogether, and the disease begins at once with some of the marked symptoms. But usually there is the preface of listlessness, depression, dull frontal headache, loss of appetite, vertigo, ringing in the ears, and irregular chills. From three to ten days this prefatory stage may last, and then the disease runs its course in three pretty distinct weekly periods.

The first week may begin with a regular chill, severe or slight (it may be absent), which is followed by such weariness and weakness as to send the strongest man to bed. Once in bed, the patient remains there throughout the whole duration of the disease. So great is the prostration that mere lifting of the head from the pillow produces dizziness and sickness at the stomach. Pretty soon, if not from the very start, there is headache, stupefaction, vacancy. It requires effort to excite interest. A sharp nose-bleeding is a quite characteristic sign in the earlier stages, and often there is some bronchitis, as evidenced by the cough. As the most marked local evidence of the disease is found in the intestines in the form of a series of ulcers affecting certain glands in its mucous membrane, the symptoms on the part of the bowels manifest themselves early in the attack and play an important part throughout its course.

Diarrhœa is the rule in typhoid fever, but the first week of the disease is quite frequently characterized by constipation. Serious mischief has been incurred by the administration of purgatives in relief of this constipation before the nature of the disease is known. During this stage of constipation, when it exists, or in the early periods of the disease, the abdomen may be sunken and have a doughy feel, but a little later it is puffed out, full, it may be, tense and even drum-like to the touch and stroke. There is tenderness to pressure, which also elicits gurgling, most marked in the lower region of the belly on the left.

When the disease is fully and fairly under weigh, diarrhœa is and remains a most prominent symptom. The stools of typhoid fever are also characteristic. After the ordinary contents of the bowel have been removed, the discharges are thin and brownish, to become, later, of light-yellow "ochre" color, and "pea-soup" consistence. In a certain proportion of cases (five to seven per cent.) the stools contain, or consist of, more or less disorganized blood, but such hemorrhage, unless copious or frequent, does not, as a rule, impart much additional gravity to the case.

Typhoid is even now distinguished from typhus fever in Germany by a different surname; typhoid being known as *Typhus abdominalis*, and typhus as *Typhus exanthematicus*. An exanthem is an eruption, and true typhus is characterized by such a general

eruption over the whole surface of the body as to be called "spotted fever," a very faulty name, oftener used, also, for *cerebro-spinal meningitis*. But typhoid fever is not devoid of an eruption on the skin. Towards the end of the first, or beginning of the second, week of the disease, there appears upon the surface of the chest or abdomen, or both, a scattered series of rose-colored spots, which disappear upon pressure, to reappear on its relief. When this eruption was first observed it was thought to be pathognomonic, that is, to be a sign absolute of the disease: but more extended observation soon disproved this view, and relegated the eruption to a very subordinate place. For whole epidemics of typhoid fever have been characterized by its absence (notably those at Tourraine), and Chomel states that "in seventy cases he could not find any trace of the eruption in more than sixteen, though it was searched for at all stages of the disease." Nevertheless, when present, which is much more frequently the case than Chomel has represented, it furnishes very valuable corroborative evidence in doubtful cases.

Add to these symptoms a coated tongue with a tendency to dryness, a dry skin, and scanty and dark-colored urine, all symptoms of the fever (the range of which is reserved for special consideration) and the story of the first week is told.

In the second week the same symptoms all persist, but in graver form. The nervous system is nearly completely benumbed. The patient must be sharply addressed, or even shaken, to elicit, even then, only a partially or totally unintelligible or irrelevant response. There is now either active delirium with incessant activity, at times even mania, or profound nervous prostration, sleepiness or stupor. The patient now lies, like a leaden image, wholly upon the back, unable, in bad cases, to even turn upon the side. This is a dangerous period of the disease, and if the fever now run very high, death may supervene. The abatement of the fever towards the end of the second week—a very common occurrence—attended by a profuse sweat, or discharge of urine, moisture of the tongue and surface, and dissipation of the fog about the brain, indicates the resolution which is to end in complete recovery.

Should the disease drag on to the third week, the stupor and delirium persist, and the prostration becomes still more profound. The patient now slips down in the bed, requiring to be continually lifted up; the urine and fæces may be discharged involuntarily or even unconsciously; the diarrhœa may become excessive—stools every half hour; the urine still more scant or almost entirely suppressed; the black tongue cracks and bleeds, the gums and teeth are incrusted with sordes, the heart's action can scarcely be felt,

the surface is hot and dry, or cold and clammy. There is twitching of the fingers, starting or jerking of any or all the members, more or less constant mumbling and muttering; in the worst cases pinched and sunken features, such almost total abolition of sensation that flies crawl unnoticed over the face, and the last hours, before complete exhaustion, are spent in picking at the bed-clothes.

"After I saw him fumble with the sheets, and play with flowers, and smile upon his fingers' ends, I knew there was but one way,"

commented Dame Quickly upon Falstaff. Such is the picture of typhoid fever at the very height of the disease, a picture so typical as to have impressed its name upon any other disease showing its signs, as a typhoid condition of that disease. Here, now, at the close of the third week is the period of greatest danger. The heart, degenerated in its substance, as is every other muscle, if the fever shall have reached a certain height, or continued high a certain length of time, may, on the slightest effort, as attempted elevation in bed, straining at stool, etc., become suddenly paralyzed and suddenly end the scene, or may gradually fail to supply the wants of the brain, and thus induce the fatal termination by gradual exhaustion. But here, too, in the midst of this imminent danger, a profuse sweat, a profuse discharge of urine, above all things, a sudden fall of temperature may dissipate the clouds, and recovery, with a long and tedious convalescence, gradually set in.

In truth, it is the rule that the fever "breaks" on the twenty-first day of the disease, leaving the patient, like a ship after a violent storm, a good deal of a wreck, but with full capabilities of complete restoration in the safe harbor of repair.

The early recognition of typhoid fever, and the future of an individual case, at any time, is largely determined by the fever as accurately registered by the thermometer. Typhoid fever has, as Wunderlich has shown, "a typical and cyclical course." In the first week the fever gradually increases; in the second week it is continuous; in the third week it is remittent; and in the fourth week (the beginning convalescence) it is intermittent—that is, in a typical uncomplicated case of typhoid fever. The range of the thermometer shows the following typical course (Fig. 7.).

During the first week of the disease the temperature rises one degree every day, and the evening temperature is always one degree higher than the morning. So a temperature of 103° or 104° on the first, second, or third day would almost, of necessity, exclude typhoid fever. Such a temperature should not be reached until towards the close of the first week. The degree to which the

temperature does rise at this time will indicate, for the most part, the general severity of the disease. A single elevation to 107° Fahr. is fatal. "Fiedler saw, with one single exception, all patients die whose temperature in the morning rose to or surpassed 106¼° Fahr. Of those whose temperature in the morning rose to 105½° Fahr., even if only on one day, more than half died." But even a lower temperature may prove fatal if sustained too long. A temperature of 104° Fahr., or even of only 103° Fahr., sustained throughout the fourth or into the fifth week and beyond, is a very grave sign. Any marked sudden elevation of the temperature, at any time in the disease, means some complication whose cause must be carefully searched. Sudden fall of the temperature at any time indicates resolution and favorable termination, though a fall below the normal degree may be the first sign of collapse and death. The range of the thermometer is, therefore, watched throughout the whole course of the disease with an interest that may at any time become anxious and intense.

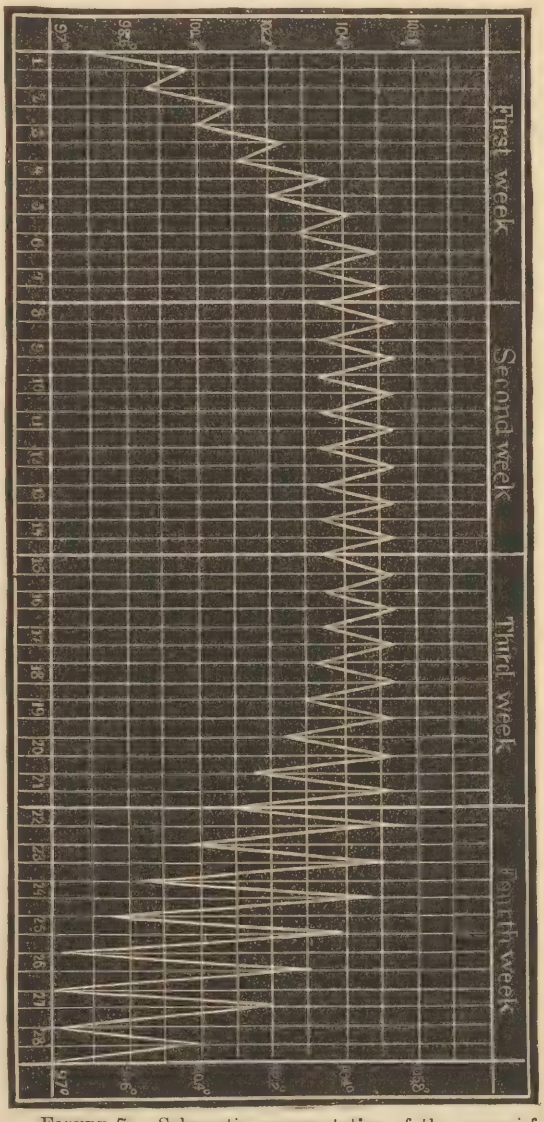


FIGURE 7. —Schematic representation of the course of the fever. The lowest morning and highest evening temperatures are given and joined by the straight lines. Fahrenheit's scale.

Probabilities.—The future of a given case of typhoid fever (the prognosis) is determined with the greatest difficulty. A walking case, a case whose symptoms are so slight as to escape recognition, may end in death by perforation of the bowels and inflammation of the interior of the abdomen (*peritonitis*), and the gravest case, with high fever and delirium, may end in recovery. Upon no one symptom may a prophecy be based. Children and aged people are easily affected with delirium, which, therefore, is not so grave a symptom in their cases. That the delirium, etc., is not caused by the fever alone is proved by the fact that the highest temperature a case may reach is never so high as in relapsing fever, an analogous disease from different and known specific causes, which is unattended with delirium, sleeplessness, or coma. It is therefore not justifiable to base the prognosis upon the brain symptoms or upon temperature alone. The strength of the individual, the hygiene of his surroundings, must be taken into account, as well as the totality of the symptoms, in estimating the results in a given case. After all, on the grand average, typhoid fever is fatal in only about fifteen per cent. of all the cases.

The Treatment of typhoid fever demands all the skill of the most able physician. Not because there is any specific in its cure, for such there is not, and perhaps never will be until its specific cause is known, but because of the complications which may momentarily arise and the excesses of individual symptoms which may momentarily be presented. The treatment of an ordinary case of typhoid fever is really more a question of management than prescription of drugs. The disease is the storm, the patient is the ship to be conducted safely through it. The physician is simply the pilot to steer away from known rocks, and not to try to allay the storm. The first injunction in such a case is to give the pilot supreme command. The officers go below when the pilot steps on board, or at most hold themselves under orders.

The attendants may be of the greatest assistance in securing a perfect hygiene. Too minute attention cannot be given to cleanliness. A typhoid fever patient should really have two beds, that he may be lifted (absolutely without effort on his part) from one to the other, while the utmost cleanliness is secured. The patient should lie in bed and be kept in bed throughout. The bladder and the bowels should be evacuated only in a bed-pan. The food should be taken on the back from a spoon or a suitable drinking-dish. There should be absolute peace of body and of mind, so far as external circumstances may secure this condition. Quiet should reign in a room containing a typhoid fever patient. Above all things, the room should be constantly filled with fresh air. Expe-

rience has shown that patients affected with fevers of any kind do not take cold. It is better to have a draught of air over a patient than to have the openings of a room closed up. The discharges should be disinfected at once, and then *burned*. To empty the contents of vessels into sewers and vaults, is to spread the contagion of the disease. The best disinfectant is pure carbolic acid. A mixture of equal parts of glycerine and carbolic acid should be kept in the room, and a quantity of it should be kept all the time in every receptacle for the discharges. For general disinfection a teaspoon to a tablespoonful of this mixture should be poured (from the spoon) on to hot coals in a shovel, and, carried everywhere about the room, be held for a time under the bed. A second case of infectious disease rarely occurs in a house whose recesses are thus penetrated with the vapor of carbolic acid two or three times a day.

The diet must be always thin, but highly nutritious. The best drink is milk. A pitcher of cold milk should stand continually in the room, and be regularly administered at stated intervals. Champagne, raspberry vinegar, toast-water, and mucilaginous drinks are grateful beverages when kept cold. Nothing allays nausea and stomach distress so well as cracked ice, which, however, must not be given too freely when the diarrhœa is too profuse. Wine whey and koumiss are indicated when the hour for light stimulation arrives; sherry, whiskey-punch, egg-nog, and brandy in great prostration. Beef-essence has lost its place as the main reliance in the way of food, its virtue being chiefly its heat. It is mostly too heavy for the delicate digestion of typhoid fever; beef-tea (*bouillon*) is better. Milk is and remains the main reliance. The idea that milk is "feverish" is a most vulgar error. Jellies have only the semblance, none of the substance of food, and are, hence, except for the sugar they contain, worthless. Wine-jellies are somewhat nutritive, because of the wine, but the other varieties of gelatines should be delivered over to the confectioner to be used only in ornamentation.

Flowers do no harm whatever. Pettenkofer has clearly shown that the air over a forest is the same as over a sea or a desert, so small is the amount of carbonic acid gas exhaled in the night; and so small is the amount of oxygen exhaled in the day, that they do no good except from an æsthetic point of view. Dead and dying flowers are too suggestive to be ever allowed in a sick-room.

The convalescence is the trying period in the history of the disease. Though a second attack is very rare, relapses are very frequent, and are mostly due to indiscretions.

An individual is not yet even convalescent until the thermom-

eter falls to the normal temperature and remains there for several days. Relapses are more fatal than original attacks, because of the debility already produced. The thermometer will register the occurrence of a relapse at once. A house is not fitted for the care of a case of typhoid fever unless furnished with a medical thermometer.

JAMES T. WHITTAKER, M.D.

Typhus Fever.

Cause.—In the year 1501, typhus fever, as we know it now, was first described. It is a germ fever, and is the scourge of armies and aggregated masses of badly-fed men. The disease has in modern days centres of activity, at which points the character of the inhabitants and their mode of life favor the propagation and preservation of the infecting germs. Ireland has for many years been such an epidemic centre, and we may regard it as much the birthplace of typhus, as India is of cholera, or Egypt of the plague. In certain provinces of Russia, in Silesia, Westphalia, Hanover, Northern Italy, we find such centres existing for years, seemingly until its appropriate material is exhausted. In the United States typhus was introduced by the Irish at the time of the great famine, and has existed ever since at points of aggregation.

Typhus was believed at one time to be of spontaneous origin. All that appeared essential for the outbreak of the disease was filth, bad food, and crowded masses of men and women. These were the conditions of its growth, not of its development,—the soil in which the germ had its nourishment. But we find it disappearing at times, even at a centre of greatest activity, only to return suddenly without an apparent cause. Formerly, and even now, among a few, this was believed to be clearly explained only by spontaneous development. In the light of the germ theory this is not an explanation. It is not difficult now to believe that the germs were latent, that they existed potentially, not actively; and when surrounded by favorable conditions again assumed activity. If the disease were to seek an entirely new centre of activity, it is more scientific to conceive of an importation of the germs from some existing centre of contagion, than of a spontaneous birth of new germs.

The infecting germs once having gained lodgment, the disease is propagated by contagion. In but few diseases is this more evident. In hospitals the nurses and resident physicians are much more liable to attack than the visiting physicians. With propinquity and persistence in exposure, the disease is but rarely escaped.

Every article used about the patient may act as a carrier of the infecting essence. The infection may lurk about an article of clothing, or utensil, for an indefinite time, either in an active condition, or dormant, and ready to renew its powers of activity and propagation, whenever placed in favoring conditions. The contagion power of different epidemics vary. The more people, the more patients that are concentrated in a limited space, the more active becomes the contagion. Thus, in camps, prisons, on ship-board, in crowded tenement houses, the infecting germs act with their greatest virulence. While aggregation will not of itself produce the disease, it seems the natural habitat of the germs.

Even in the conditions most favorable to the greatest intensity of the germs, improved hygienic conditions lessen the contagiousness of the disease. Lebert, in the hospital in which he observed the disease, says, that in the wards which were well ventilated, even in winter, none of the physicians or students contracted typhus. The same author observed that men working in the open air were more liable to attack than those who had confined occupations, such as locksmiths, joiners, cobblers, and tailors. In the place referred to (Breslau), children of both sexes were very liable to the disease, which is not true of all epidemics.

It has been asserted that the disease may have its origin in famine. Such seemed to be the experience in Ireland. This can hardly be so. Famine may debilitate and may develop physical conditions that favor the onset of any disease, but it cannot infect, or of itself originate infecting germs. Years of famine, especially in the latitude of Ireland, are generally cold and wet; and a steady condition of moisture favors the growth of germ life, and consequently years of famine may also be periods favorable to the growth and dissemination of the essential elements of typhus fever.

Hirsch, who studied the atmospheric conditions of thirty-five epidemics of typhus, shows that this disease is much more independent of meteorological conditions than typhoid fever. These conditions are by no means constant, even in epidemics of equal intensity. Lebert believes that the influence of the surface saturation of the soil is great. From this cause, the typhus germs, like those of nearly all infectious diseases, find breeding places in the surface-water, and thence find their way readily into wells and springs, thus infecting the drinking-water. Even Hirsch admits that the disease is favored by low, damp places.

Men are more liable to attack than women, the difference being 55 and 44 per cent. The ages of twenty to forty years showed the greatest liability to attack. The decades preceding and follow-

ing these two extremes exhibited a less favorable disposition to the disease, while in infancy and old age the liability regularly diminished.

An attack of typhoid fever does not exempt one from an attack of typhus, and the opposite is true ; but a comparative immunity against a second attack exists after the individual has recovered from typhus. This is the rule for all contagious eruptive diseases.

Symptoms.—The disease begins by what are called *prodromes*, or signs. This is the rule, but there are exceptions. These are, pains in the head, neck, back, limbs, loss of appetite, nausea or vomiting, sleeplessness, a sense of extreme fatigue, mental dulness, and gloom. These signs last for a varying period, a few days usually, now and then several weeks. During this time the patient may be able to work. If the attack be very severe, these warnings may be absent, and the first sign be the explosive outbreak of the disease. Sometimes these initial symptoms may end here, the after-fever being but slight and transient. This is called the abortive form.

The prodromes over, the patient is ready for the full onset of the fever. This is oftentimes a chill followed by fever, like an intermittent, but chill, or not, the fever quickly follows with considerable intensity. At this stage the skin is hot and red, the face swollen, the eyes bloodshot, and the headache severe and constant. Mentally, the patient is confused and dull, with giddiness on getting up, and ringing in the ears. The pains in the limbs and joints are severe. Sore throat and nasal catarrh are common.

The pulse is peculiar. From a natural beat to 100 in the morning, it rapidly increases to 115, or 125 in the minute toward evening. At first the pulse is full and strong, but soon becomes soft and feeble. Lebert noticed that in some cases with profound stupor, which were quickly fatal, the range of the pulse was below the normal.

The temperature rapidly increases, so that on the morning of the third day it ranges from 103° to 104° Fahr., and in the evening a degree higher. This is about the range of bodily heat for the first week. A high morning and evening temperature indicates a grave case. A marked remission or subsidence in the morning, no matter what the evening heat may be, is a favorable sign. The temperature is high during the first part of the second week, rarely passing the limit of 107.5° Fahr. After that, and even before, in light cases the fever begins to decline.

From the very onset great *muscular weakness* is present, and

increases very rapidly. There is considerable bluntness to sensibility, as the patient makes but little complaint of the severe pains in the back and limbs.

Mind.—Apathetic and drowsy as he appears, yet sleepless nights are the rule. He answers questions slowly and with indifference. He becomes delirious and needs careful watching, or is troubled by frightful dreams.

The tongue is coated, at first white, then yellow, and lastly dry and brown.

In the second half of the first week the *eruption*, which is a characteristic of the disease, makes its appearance. It closely resembles measles, and is classed as a roseola. In some cases it appears at the end of the first week, and now and then is not present at all. The rash is abundant on the chest, abdomen, back, face, and limbs ; and begins to fade toward the close of the second week.

This closes the congestive febrile stage. Next in order is the stage of depression. Mental depression, with more quiet delirium, sleepiness, stupor, coma, are the cerebral symptoms. The patient has rapidly emaciated. The intensity of the fever has lessened, but the pulse has grown small and jerking, beating from 110 to 140. Sign of catarrhal irritation of the lungs are present, with dry, red throat. The bowels are sometimes relaxed, and move off unconsciously to the patient. The urine is scanty, dark, contains albumen, rarely blood, and in severe cases escapes involuntarily, or is retained. At this stage the spleen is found enlarged and tender.

A favorable termination of the case begins in a diminution of the fever in from ten to fourteen days, or even at the end of the third week. This cessation of the fever is generally sudden—from a high temperature to the normal, or below ; the skin becomes soft and moist ; the tongue begins to clean along the edges ; the urine increases in amount, but is heavily loaded with sediment ; the appetite improves, and the patient becomes convalescent. From this point recovery is slow, but not so much so as in typhoid fever ; generally in a month the patient returns to his work.

Recovery is the rule ; eighty-five per cent. get well. Death, when it takes place, occurs about the third week, and is generally heralded by profound coma and complete prostration. The outlook of the case is favorable in childhood and youth, comparatively favorable to the thirtieth year, and from that point gradually declines to one-half between fifty and sixty years of age. Old people generally die of lung inflammation. The strong are more liable to recovery than the feeble.

Treatment.—Under this head we may speak of what is more

important than treatment, namely, *prevention*. Typhus, like all the diseases in this chapter, gives way before the gospel of cleanliness. In the crowded slums of a city the doctor who preaches, and enforces by the strong arm of the law, cleanliness, does more immediate good than a missionary who distributes tracts. Prevention lies in scattering crowded masses of underfed, dirty and neglected humanity; ventilation, improved drainage and pure drinking water are equally important. The enforcement of a rigid quarantine against distant centres of epidemic is demanded imperatively. When in a city, every centre of activity should be isolated, or the patients removed, and the infected buildings closed and disinfected by fumigation with burning sulphur. When patients are treated in their homes, the house ought to be placarded to prevent people coming in; and after the recovery of the patient mattresses should be emptied and their contents destroyed by fire, and all clothing used about the room, and patient as well as the room disinfected by heat and sulphur fumes.

The layman should not undertake the treatment of a case of typhus fever when the services of a physician can be obtained. For the benefit of those who cannot obtain immediate aid the following general plan is given. Lebert says, "I give drugs chiefly to satisfy the patients and their friends."

Cold is well borne by the patient during the febrile congestive stage, therefore the windows should be left open and the patient given sponge baths at frequent intervals, with the water at 65° Fahr., and be repeated as often as the temperature of the body reaches 102° Fahr. The patient should be kept quiet, and experienced nurses obtained, as the care is exhaustive. Ice-water, lemonade, and effervescing drinks may be given freely. The diet should be fluid, such as milk, beef-tea, broth, and soups, given in small quantities every two or three hours. Ice-bags, or cold compresses to the head give great relief. There may be no fear of placing the patient in a cold bath, even every three or four hours in a severe case, and letting him remain there until his temperature is lowered to the normal. Lebert gives dilute phosphoric acid in the proportion of a drachm to four ounces of water and raspberry syrup, of which a teaspoonful may be given every two hours.

Constipation, which is often present, may be relieved by cold-water injections. When the strength fails rapidly, stimulants may be given more freely than in nearly any other disease. A solution of five grains of carbonate of ammonia, thirty drops of ether in two ounces of water; or camphor in doses of two to five grains in a pill, or powdered with white sugar, every fourth hour, may also be given as excitants; large doses of quinine, from fifteen to thirty

grains when the fever is very high: that is, when the body temperature is 104°, 105°, and 106° Fahr., may be given for the purpose of lowering the heat. Small doses of opium, one-fourth to one-half a grain, may be used for the purpose of allaying the pain in the head and limbs, and to aid in procuring sleep.

When the improvement has set in, the diet should be more nourishing, but the patient should be guarded against over-feeding for the first two weeks after convalescence.

Work should not be resumed until the strength is fully regained.

Yellow Fever.

Cause.—The infecting essence upon which yellow fever depends shows marked differences from that of nearly all other infectious diseases. The first is its dependence upon certain conditions of temperature. The mean temperature must reach at least 72° Fahr., in order to insure malignancy in the germs; secondly, a fall of temperature to the freezing point destroys the infecting quality of the germs; and thirdly, the ease with which the area of its activity is circumscribed by elevated regions.

The disease follows the channels of commerce. It breaks out in seaports, and, when penetrating into interior regions, follows the watercourses of commerce. In breaking out in a city to which it is imported, it follows the rule of nearly all acute infectious diseases, by appearing first in the filth centres—the sailors' quarters and low tenements, especially when near the water, where animal and vegetable matters accumulate and putrefy.

South America is generally looked upon as the active epidemic centre of yellow fever, from which point, by the bilge-water and filthy holds of vessels, the germs are carried to more temperate latitudes. That the disease cannot originate in filth is certain, since it has been repeatedly shown that, no matter how filthy a ship may be, the disease will not break out among the crew until the vessel has touched at some port in which the disease is rife.

Another trait of yellow fever germs is the extent to which individual susceptibility is modified by race and acclimation. The history of the disease has shown that the negro race possesses nearly a total immunity. People of this race, however, after a long residence in a northern climate, lose their race immunity and may become victims of the infection. Yellow fever shows its most marked potency in the white race; but acclimation may secure considerable safety to one of this race. Safety demands, however, that these persons reside constantly in a hot, or semi-tropic climate; for, after a residence in a temperate region, a subsequent return

to the tropics entails a re-acclimation in order to secure a partial exemption from the disease.

Many able writers believe that the germ of yellow fever is a living miasm; that it does not develop in the bodies of the subjects to be thus spread from one case to another (contagion), but that the specific miasmatic germs rapidly propagate themselves in the favoring conditions of heat, filth, and moisture. We consequently find the disease occurring in the hot months in moist regions, like the mouths of large rivers in tropical countries, which generally form epidemic centres.

The epidemic in the United States in 1878 was marked by some rather unusual traits. Small towns away from large watercourses of navigation suffered severely, and the infecting germs showed an unusual resistance to low temperature.

Some forms of occupation predispose to yellow fever, but slightly however. All occupations which have to be conducted in a high temperature predispose to yellow fever; while tanners, soap boilers, candle-makers, scavengers, and all who are engaged in a bad, unhealthy atmosphere, are less disposed to the disease.

Symptoms.—After an exposure to the infection there is a period before the development of the disease, varying from twelve hours to two or three days. As a prelude to the full onset of the diseaes, there are prodroma (signs). These are lassitude, headache, pain in the back and limbs. Epidemics of yellow fever occur in which early signs are absent. The attack begins with a chill more or less severe, with great prostration and restlessness. This is rapidly followed by fever as high as 102° Fahr. in a few hours, with intense headache often confined to one side, congested eyes, flushed face, and an anxious expression. The respiration is quick and short, and the pulse rapid and full. By the end of the first or second day a peculiar corpse-like smell is noticed from the body when the bed clothes are raised. The tongue is slightly swollen, and covered with a whitish or yellowish fur, with red edges; while the mucous membrane of the throat becomes at first of a bright-red color, and then swollen, the gums around the teeth having the same appearance. The stomach is very sensitive on pressure, and all food and drink are vomited as soon as taken. The bowels are constipated, except rarely, when diarrhœa is present. The lower portion of the back is the seat of intense pain. The urine is scanty, turbid, and, in some cases, from the beginning shows traces of albumen. In other cases the urine is suppressed, even from the first. The disease has reached its climax on the second or third day. The temperature is at the highest, 105° Fahr.; the skin and eyes are jaundiced, the urine loaded with bile, and the evacuations

from the bowels are clay-colored. Hemorrhage from the nose occurs, and now and then from the stomach; this latter is a sign of great intensity of infection, and is generally a fatal symptom.

This completes the first stage. *The second stage* begins on the third or fourth day, and is known by a marked remission of nearly all the symptoms. The temperature of the body falls to 100° Fahr., or to the normal; the pains in the head and limbs cease, and the patient fancies the attack is over. The tenderness over the stomach and vomiting generally remains; and albumen in the urine is nearly always noticed now, if absent in the first stage. The remission lasts from several hours to two days. In very favorable cases this may be the end of the attack, and the patient pass at once into convalescence.

The third stage is the usual course of events. The symptoms of the first stage return in an aggravated form. The fever reaches 104° Fahr. in the course of the first or second day. The mind may be clear, but an overpowering apathy exists; while a furious delirium occurs in many cases, in which it is difficult to control the patient. The jaundice becomes very intense, reaching a dark, coppery color. Hemorrhage is a marked symptom of this stage. The blood comes from the mucous membrane of the nose, mouth, and all the digestive tract, and sometimes from the skin and genitals. Hemorrhage into the stomach is the occasion of the name "*black vomit*," and is a very dangerous symptom.

A symptom equally dangerous is suppression of the urine, and is one that causes great suffering. In some epidemics suppuration of the glands located behind the angle of the lower jaw is noticed, as well as the formation of boils over the body.

Death usually occurs in this stage. In the last few hours the patient falls into a deep stupor, from which he never awakes. The act of death is usually attended by convulsive action of the diaphragm and twitching of the muscles, while the temperature falls rapidly to 100° Fahr., or under.

A favorable termination of the attack is the occurrence of convalescence directly after the second stage, the continuance of the excretion of urine during the third stage, and the absence or slight amount of hemorrhage into the stomach (black vomit). When the third stage terminates in recovery, the fever abates suddenly to the normal with profuse sweating and the prompt disappearance of all pain. Convalescence is always slow.

Treatment and Prevention.—The question in yellow fever outbreaks is prophylactic (preventive) rather than curative. Preventive measures must be under the direct care of government. Local health boards and measures are, by themselves, hopeless to con-

tend with the spread of an epidemic of yellow fever, as we have proven to our cost. The strongest quarantine is necessary. All intercourse between infected ports and ships in which the disease exists must be cut off. The quarantine of infected ships, persons, and goods, must exist for at least two weeks. The modern theory of quarantine in relation to yellow fever is tending to the complete exclusion of manufactured products from infected ports, and from vessels known to be infected, while healthy persons after change of garments may be allowed to go free. Disinfection, as a means of destroying germs as potent as those of yellow fever, is practiced on an *assumption* of its value, rather than from actual proof.

People within the area of an epidemic must avoid panic, live temperately, and cleanly, and avoid all conditions known to depress the general vigor of the system. Some physicians, who have had experience in yellow fever centres, recommend quinine as a preventive medicine, and others recommend the use of metallic mercury, or some of its salts.* [Such as calomel.]

The treatment of the disease is, unfortunately, by no means settled. The treatment is mainly symptomatic; that is, remedies are directed to each separate phase of the disease as it presents itself. At the beginning, a purge of ten grains of calomel is quite generally used, and for the pain in the back, dry and wet cups or blisters are applied to the parts. Morphine, in small and frequent doses ($\frac{1}{4}$ to $\frac{1}{2}$ of a grain), and small pieces of ice are used to control vomiting. The latter is also useful to control bleeding from the stomach, and may be used in the form of ice-bags over that region. The high fever is in a measure controlled by quinia. In the epidemic of 1878 in the southwest, large or ante-febrile doses of the drug were given, and with some success. This use of quinine consists in making a profound impression by giving from twenty to thirty grains at a dose, followed every hour or two by ten-grain doses to maintain the effect. From the great irritability of the stomach, it is sometimes advisable to administer the quinia by means of a hypodermic syringe.

The strength must be kept up by all possible means, although great difficulty is encountered, owing to the constant vomiting.

[* The late Dr. Josiah C. Nott, of Mobile, Ala., whose experience with yellow fever was extensive, said he had observed that persons living in infected districts, but who remained in the upper stories of their houses, were much more apt to escape the disease than those who frequented the ground floor.—Ed.]

The Plague.

Cause.—In Northern Africa, in Turkey, Persia, in Southeastern Europe, along the Danube and shores of the Black Sea, a disease known as the pest, plague, or bubo-plague, has occasionally prevailed epidemically for many ages. In the earlier parts of the present century severe outbreaks occurred. For the last two decades, however, these usual centres have been free from the disease, if we except Russia during the winter of 1878–9.

The evidence is that the disease is not self-originating, but is spread by infection from existing centres of the disease ; that it spreads by contagion, although favored in its spread by filth and all manner of unsanitary surroundings. We may not, however, regard the plague as contagious as small-pox, but that it belongs to the class of contagious miasmatic diseases.

Unlike the yellow fever germs, those of the plague survive the most extreme cold weather. The epidemics of Cairo usually abated with the beginning of summer heat. No race or sex is exempt from infection, although some occupations, such as dealers in oils and fat, water-carriers, and attendants at baths, are believed to enjoy a partial exemption. Persons over fifty years of age are said to be rarely attacked.

Symptoms.—The disease has a period of incubation [the period between the exposure and the development of symptoms] of from two to seven days. The first stage seems to be an intoxication with the infection germs, staggering gait, thick and confused speech, fulness and dizziness of the head ; a chill is sometimes present, followed by fever, often not. Following this is intense fever ; rapid breathing ; the tongue covered with a pearl-like coating ; there is mild or furious delirium which, toward the end, merges into stupor. The tongue becomes dry, cracked, and black, and thick, dark crusts cover the gums and teeth. The action of the heart becomes weak, the extremities cold, and the lips and finger-nails blue. This completes the second stage. If life continues the third, or bubo stage, develops. With these local evidences of infection the fever declines, the pulse grows firmer, a thick and ill-smelling perspiration covers the body. The lymphatic glands, chiefly in the groin, but also in the arm-pits and round the neck, begin to swell and inflame, oftentimes passing rapidly to suppuration, in which event an offensive and corroding pus escapes. Suppuration is considered a favorable omen. Very often the inflammatory action in the glands ceases short of pus formation. More rarely, carbuncles are found on the lower extremities princi-

pally, which show a marked tendency to gangrene. In very severe cases, black and blue spots (*ecchymoses*), and flea-bite-like eruptions (*petechiæ*) appear upon the body.

In favorable cases convalescence begins on the sixth to tenth days, and is very liable to be complicated with continued suppuration of the buboes. After-effects (*sequelæ*) may be pneumonia, abscess of the parotid glands, boils, and a typhus-like fever.

Death may occur at any stage of the disease, sometimes even before the disease has assumed distinct shape, but it usually takes place from the third to the fifth days. After the seventh day recovery is the rule, subject to the dangers of the after-effects. The plague is the most fatal of all the infectious diseases, the mortality ranging from seventy to ninety in a hundred.

Treatment.—It is not difficult for the reader to realize how little benefit is to be expected from treatment in a disease of such rapid and fearful character. Cold baths during the height of the fever, stimulants during the period of depression, and poultices to the buboes and speedy outlet to the pus, are the usual remedies. The chief duty of the physicians in an outbreak of the plague lies in the direction of preventive measures. The story of the quarantine against this disease in some of the epidemics reads like a romance. The most rigid quarantine ever known in the history of disease has been connected with the plague. The results have been most beneficent, notwithstanding the inhumanity and hardship which were the outcomes of the strenuous preventive measures. Hirsch says that "the extinction of the plague was a gradual process, and kept pace, in a great measure, with the development and perfection of the quarantine system as carried out, not only with reference to the East, but also between neighboring countries of Europe."

The Black Death.

Most authors agree that the black death and the plague are identical. In the fourteenth century this disease, the mortality from which exceeded that of any other disease recorded in history, devastated nearly all the then known inhabited portions of the earth. In the black death all of the symptoms described in the plague were present, except that a quickly fatal disease often complicated the black death. Hirsch thinks that he has found a revival of the black death in the India plague of 1815–20, and in the Pali plague of 1836. These outbreaks were bubo-plagues.

Relapsing Fever.

This disease is essentially one of recent history, in the sense that it was only identified clearly in 1850. This result was brought about by the epidemics of England, Ireland, and Scotland in 1842. Bilious typhoid is a phase of the disease, and they will be considered together.

Cause.—Like typhus, relapsing fever is clearly recognized as a filth-disease. The infecting germs find their habitat in crowded lodging-houses, impure drinking water, and all manner of uncleanliness that attends human aggregation. The disease is clearly contagious, but also establishes for itself epidemic centres. It may be, and Lebert thinks it quite likely, that relapsing fever is one of those rare diseases in which the infecting germ has been identified. Obermeier found, in cases of the disease in which the blood of the patients was examined under a high power of the microscope, a minute spiral filament of a diameter of 0.001 millimetre, and a length of 0.15 to 0.2 millimetre, with a rapid twisting motion. Other observers have confirmed this, and have observed them in great numbers. They quickly disappear on the lessening of the fever. Lebert says these filaments (*protomycites*) were never absent in any case observed by him. An incubation period (a period between exposure and development of symptoms) of from one to seven days, has been observed.

The disease frequently attacks children, and one-fourth the cases occur in persons between thirty and forty years of age ; after the fiftieth year a more or less complete exemption is observed. Meteorological influence has but little effect ; two of the epidemics recorded by Lebert were in the summer, and one in the winter.

Symptoms.—This disease is noted among acute infectious disorders for the rapidity of its onset. There are, as a rule, no premonitory symptoms. The disease begins with a high fever ; in about half the cases only is there a preceding chill, but in place of it nausea and vomiting are frequent. The fever is continued and intense from the beginning, with all the usual attendants of high body temperature. There is a temperature of 102° Fahr. in the morning and 104° Fahr. in the evening, and two or three days later an excess of 2° Fahr. over both these. Prostration is marked from the outset ; the pulse rapid though weak, and the tongue is thickly coated and soon becomes dry ; the bowels are constipated as a rule.

By the second day a sense of pain and tenderness is noticed on the left side, under the floating ribs. These are signs that the

spleen is involved. The organ increases rapidly from day to day, even hour to hour. The liver also shows symptoms of tenderness and slight inflammation. At this stage there are great pain and tenderness in the muscles of the body—often of a most severe and piercing character. From the fifth to the seventh day these symptoms suddenly cease. The fever and pain, with all the attending symptoms, disappear; the appetite returns, the tongue cleans, and the patient offers all the evidences of returning health. This remission of the disease lasts on the average about seven days.

The relapse occurs suddenly, with all the symptoms enumerated in the first stage. The infecting filaments are again found in the blood. The only difference that is at all marked between the relapse and the first stage is the greater remission between the morning and evening fever, to the great comfort of the patient, while the liver and spleen again present evidences of inflammation. This relapse lasts from three to seven days. Sometimes a marked aggravation of all the symptoms occur a few hours before the final cessation of the symptoms, which usually occurs in the night by a profuse perspiration, with a normal temperature in the morning.

A third relapse is observed in some epidemics, but usually the course of the disease is now completed. The patient is left emaciated and weak. The convalescence is slow, lasting from two to four weeks.

The termination of relapsing fever is generally favorable, the death-rate being from two to three cases in a hundred. In epidemics attended with bilious typhoid the mortality is increased to about ten per cent.

Death may take place in the first stage from complications, which often consist in implication of the lungs; or from intensity of the fever, even in the first stage, or from exhaustion during the relapse. A common cause of death is from abscess of the spleen resulting in pus-poisoning (*pyæmia*); or from rupture of the abscess and consequent acute inflammation of the interior of the abdomen (*peritonitis*).

It seems needless to repeat all the symptoms of *bilious typhoid.* It is simply necessary to add to the above a marked "typhoid condition," a most marked jaundice (*icterus*), with a less decided feature of intermission and relapse, and the reader has, broadly, all the prominent morbid events of bilious typhoid. Many good authorities regard it, however, as a distinct disease from relapsing fever. The treatment is identical with that of the latter.

Treatment.—Lebert, the great advocate of the expectant method

of treatment, virtually says, do nothing. While this is said from the purely scientific standpoint, it will not do in practice. There is a great moral value in treatment, even when nothing but negative results are expected by the physician. The patient is satisfied that something is being done to relieve his sufferings; and the friends, that the sick man is not neglected. There is a great difference, however, between giving medicine in expectation of a cure being performed, and offering the kind attentions and giving the simple remedies that mitigate or relieve the symptoms of the disease as they present themselves. From the low rate of mortality, the reader may perceive that relapsing fever is self-limited; that is, it runs its course with a natural tendency to recovery. This may be said of diseases which are far more liable to a fatal result—such as small-pox and scarlet fever—with equal truth.

In relapsing fever the diet should be simple, fluid, and cooling during the first stage. Headache may be considerably assuaged by ice-bags to the head; and the severe muscular pains will partially yield to friction with chloroform liniment. One half a grain of opium, or four or five minims of "Magendie's solution" as a hypodermic injection of morphia, may be given for the same purpose every five to eight hours. The pain and tenderness of the spleen is best treated by cold applications or by persistent poultices. With evidences of prostration, alcoholic stimulants or wine may be given in small and frequently repeated doses.

Diarrhœa, which is a common feature of bilious typhoid, may be controlled by half-grain doses of opium, or two grains of tannin, repeated every two to ten hours. In cases of delirium, hydrate of chloral in fifteen-grain doses dissolved in a half-wineglassful of sweetened water, and repeated every hour until eight doses have been given, may be used.

During the intermission, every measure should be employed to keep up the strength in anticipation of the relapse. Quinia in three-grain doses every five hours, full diet, and wine, may be expected to answer this purpose. The same measures will be useful during the convalescence.

As in all the infectious fevers, prophylaxis (preventive measures) must receive attention. Herein lies the true medical care of relapsing-fever epidemics. The measures already detailed in relation to other epidemics apply to this disease.

Miliary Fever.

Causes and History.—By this name is meant a specific fever of infectious origin, occurring in circumscribed epidemics. In the

older history of epidemiology it was known as "*Sudor Anglicus*," or "English sweating-sickness." The disease acquired its modern name by being attended by a fine isolated rash, called "miliary eruption." The disease was first clearly defined in England in 1487. In later parts of the middle ages and in other countries, the disease prevailed to a varying extent, and sometimes with terrible fatality. The disease disappeared for one hundred and sixty years, and again received historical notice in the latter part of the eighteenth century.

The cause shows quite a dependence on meteorological influences. Of 174 epidemics tabulated by Hirsch, 59 began in the spring, 78 in the summer, only 8 in the autumn, and 28 in the winter. Heat and moisture may be regarded as essentials to the development of the infection. The disease is not regarded as contagious in the general use of the word, although some authors have regarded the fluid in the vesicles as the vehicle of the contagion, but observation has shown the error of this.

Except that the disease is classed among germ fevers, nothing is known regarding the direct cause. Both sexes seem equally liable to infection, and those in strong, robust health are especially disposed to be attacked.

Epidemics of miliary fever have been observed to occur simultaneously with those of scarlet fever, but the best observers do not consider that any relation exists between them. The same relation in the order of occurrence, but more marked, has been observed in epidemic cholera. The best authorities incline to the belief that the coincidence of the two diseases is accidental.

Symptoms.—The attack is usually heralded by prodromes (signs) which last from two to three days. These are irritation of the skin, weakness, headache, thirst, a painful sense of oppression in the stomach. In mild cases these precursors are wanting. The attack occurs, usually, late in the afternoon or at night, and is announced by slight chilliness, with profuse sweating, and pricking and tingling of the skin. This sweat is of an acid reaction, and is so profuse that the bedding and mattress may be saturated. This is accompanied with severe fever; the pulse beats at the rate of 130 in a minute; there are violent pulsations of the heart, and severe chest-pains leading to irregular or rapid breathing, and tenderness over the region of the stomach. The bowels are generally constipated; the urine is scanty and high-colored, with occasional attacks of pain referable to the neck of the bladder and inability to pass urine.

On the third or fourth day the rash appears. This rash (*exanthem*) consists of small, round, shaded, red spots, sometimes ar-

ranged in groups, at other times generally and regularly diffused. In a few hours after their appearance, a vesicle (or small bladder of fluid) raises in the centre, at first so small as to be seen with difficulty, but soon enlarging to the size of a millet-seed—from which the disease gets its name "miliary"—or even to the size of a pea. This vesicle contains a clear fluid, which soon becomes thick and yellow from pus, and in a few days (two or three) bursts, dries up, and lastly, scales off. The rash spreads usually by regular steps, first upon the face and chest, thence to the back and extremities, and is sometimes seen upon the mucous membrane of the mouth. The duration of the disease is from six to eight days; one, two, or three days being devoted to the sweating stage, and the remainder to the eruptive stage of the disease.

Some epidemics have rarely been attended by fatal results, others were very fatal. Death, when it occurs, has usually been during the sweating stage.

Treatment.—Various plans have been adopted to stay the course of the symptoms. At one time the eruption was looked upon as a crisis in the attack, and was therefore encouraged by drugs which favor perspiration, warm drinks, and heavy covering. Considering the intensity of the fever this plan must have been cruel in the extreme. A more rational plan consists in lowering the excessive bodily temperature of the first stage by quinia in ten to fifteen-grain doses, repeated every two to five hours, and cold sponge-baths. The acute headache and chest-pains may be allayed by grain doses of opium (for adults). The tenderness and painful sense of tightness over the stomach is best treated by mustard poultices, or by injections of six to eight minims of morphine solution (Magendie's) under the skin. Purgatives should be avoided. Acetate of potash, in thirty-grain doses dissolved in water, may be given to assist the kidneys, and fluid diet and acid and cooling drinks may be freely employed.

The tendency of the treatment is toward the expectant method. This is true, as the reader has seen, of nearly, if not all, the specific, acute infectious diseases. This is highly proper, as by this means the people are educated to regard less the false laws of cure than the important measures of prevention. When high and low alike are taught that there are no cures for the infectious germ-diseases—in the sense that quinine is a cure in intermittent fever—they will become more careful of preventive measures, which is curative treatment in its best and widest sense.

Dengue Fever.

Cause.—The name "dengue" is a Spanish corruption of the word dandy, so called from the affected, dandyish gait the patients were forced to adopt. It is also called, especially in the Southern States, break-bone fever. Dr. Rush described an epidemic of dengue in Philadelphia in 1780. It has prevailed extensively in the West Indies at various periods. In the South, various epidemics of it have occurred, the last in 1866. Solitary cases have been observed in northern cities—Boston and New York. In 1871–72 an epidemic broke out in Arabia, where it was called "the father of the knee." This epidemic spread to the islands on the east coast of Africa. At Port Saïd the disease is said to prevail every year at harvest time. The contagious nature of the disease is not settled, although there are facts which show that dengue may be conveyed from distant places in articles of clothing, and by other means. Epidemics have occurred at all seasons of the year. A singular coincidence has been noted between some outbreaks of the disease and yellow fever. All nationalities and races, except the negro, are equally liable to dengue fever, while recent arrivals in tropic, or near tropic regions, appear to have the disease lighter than the acclimated.

Symptoms.—Evidences of the approaching attack are noticed in about half the cases. These are usually chilliness, pain in the head and back, and a burning sensation in the stomach. The full onset of the disease is attended with fever and by painful swelling of the joints, both great and small. The skin of the face and neck has a red, swollen look, which often extends to the eyes. The fever reaches its height in about twelve hours, and is noted for its intensity; as high as 106.7°, 107°, and 108.8° Fahr. has been noted by different observers. The fever is continuous; the pulse ranges from 120 to 140, and the respirations 28 to 30 in the minute. In from two to seven days there is an abatement in the symptoms, announced by a critical sweating, diarrhœa, or bleeding from the nose. This state of affairs, which resembles the intermission of relapsing fever, lasts one or two days, and is followed by a return of the fever, of lighter grade and less continuous. The relapse is not always attended with a return of the pain and swelling in the joints, but is quite certainly complicated with a skin eruption consisting of small inflamed points—sometimes confined to the face, arms, and chest, and in some cases extending over the whole body. It lasts from a few hours to two or three days. The affection of the limbs and joints is described as rheumatic or rheumatoid (resembling rheumatism), and shifts

rapidly from point to point. This symptom usually diminishes with the fever, but in some cases it becomes chronic and yields only after weeks or many months. The patient becomes quickly emaciated and there is great loss of strength, which is recovered only after a long convalescence. Relapses after intervals of several weeks are not rare, but are usually less severe than the primary attack.

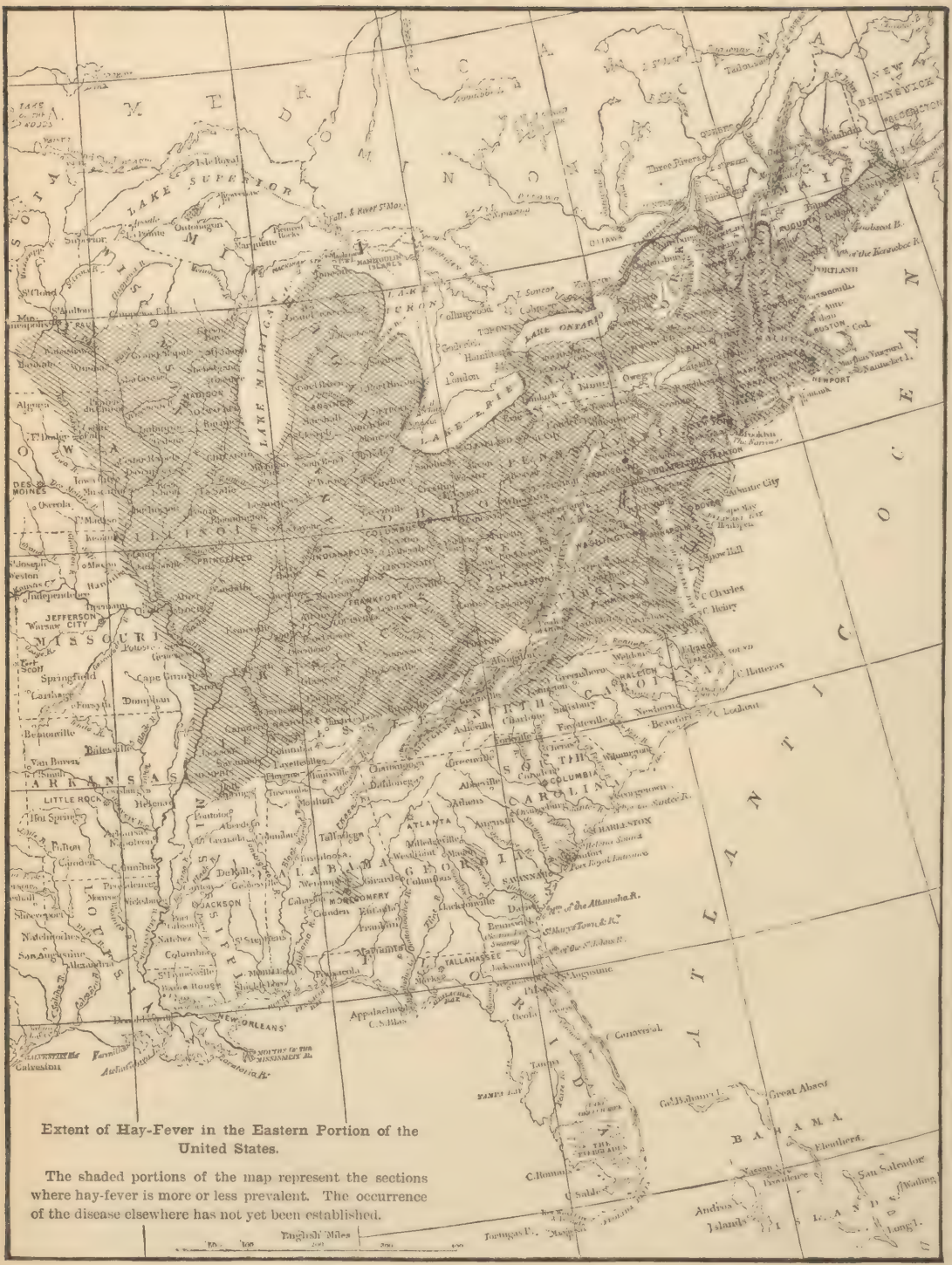
The result of the disease is usually very favorable, but among children it is sometimes fatal from secondary implication of the nervous system, which, fortunately, is rare.

Treatment.—The remedies employed in the tropics consist of the early use of cathartics and emetics, followed by quinia in three- to five-grain doses. Belladonna in large doses is used to relieve the rheumatic pains, as well as colchicum in half-drachm doses of the wine of that drug. Cold baths in the febrile stage are useful. The painful joints may be treated by chloroform liniment, and, in case this symptom survives the disease, iodide of potassium in five-grain doses three times daily may shorten this most troublesome part of the disease. The great weakness of convalescence should be treated by the bitter tonics (such as colombo, gentian, cinchona, or quassia, in doses of two teaspoonfuls of tincture with water), wine, and nourishing diet.

To arrest the spread of the disease, Sheriff recommends the isolation of patients and the quarantine of epidemic centres of the disease.

Hay Fever.

Cause and Distribution.—The disease known as autumnal catarrh, summer catarrh, hay asthma, *Catarrhus æstivus*, and Bostock's catarrh, has been known and studied since the early part of this century. The morbid or infecting essence has never yet been identified. The evidence of those attacked show that the disease is not due to atmospheric causes, but to vegetable dust, or pollen. The outbreak occurs during the midsummer or early fall, and at the time when flowering plants are in their most active condition. Many patients, when they first approach a meadow in bloom, or a field of new-made hay, or ripe grain, at once feel an attack coming on by the tingling of the nose and sneezing. Blackley experimented with the pollen of seventy-four kinds of plants, from many of which he obtained, by either inhaling the pollen-dust, or placing it on the lining membrane of the nose, symptoms closely resembling those of hay fever. Blackley further shows, by careful experiment, that the disease always prevails at those seasons when the largest amount of pollen is diffused through



Extent of Hay-Fever in the Eastern Portion of the United States.

The shaded portions of the map represent the sections where hay-fever is more or less prevalent. The occurrence of the disease elsewhere has not yet been established.

the air. Wyman, in his monograph on this subject, gives the following reasons for a belief in the vegetable origin of the disease: 1. It has a fixed time for its appearance, namely, the time of flowering of many plants. 2. A fixed time of disappearance, when vegetation declines. 3. It disappears on the appearance of frost. 4. The existence of the disease in certain regions only. 5. Its entire absence at sea.

Wyman has tabulated those regions of the United States which are exempt from the disease, some of which are resorted to for the purpose of cure. It will be of value to condense this table for the use of our readers: The White Mountains and vicinity; the group of the Franconia Mountains; the Green Mountains; the regions east of the White Mountains; the plateau and mountains of the Adirondack region; the New York and Ohio plateau; the Alleghany Mountains; the Great Lakes and the Upper Mississippi River. The New York and Ohio plateau has an average height of about 1,500 feet above the sea, and is regarded by Wyman as nearly totally exempt. The Lake Region has only a general elevation of 400 feet. It is safe to assert that no region is safe, to those liable to attack, that is under 1,000 feet above the sea-level, especially in regions of rank vegetation.

The age of those attacked is usually under fifty years. Twice as many men as women are attacked, but this may be in a measure explained by the fact that those who are much exposed to the open air are more liable than others who lead an indoor life. It has been asserted that the disease belongs to the educated classes; but this is not so, judging from Wyman, unless the bricklayers and blacksmiths are all learned. Zuelzer says that the disease never appears among the residents of the rural districts, but experience in the United States certainly shows the contrary. Certain persons are exempt; but why, it is impossible to say. That the exempt classes owe their immunity to ignorance, or country life, is absurd. Those with a nervous temperament are more exposed to attacks than others, and hereditary influence is believed to exert a predisposition to the disease.

[Dr. George M. Beard, of New York, has published a work on hay fever, based on the study of several hundred cases. His theory is that hay fever is a neurosis—that is, a functional disease of the nervous system. According to this theory, the disease is subjective instead of objective—a part of the constitution. The external irritants, which are infinite in number, such as pollen of grains and weeds of various kinds, heat, sunlight, and so forth, being of a secondary and tertiary character, are powerless of themselves to produce the disease, unless acting on a nervous idiosyn-

crasy—that is, a nervous system specially sensitive to the influence of some one of these irritants.

Dr. Beard has described a new form of the disease, which he calls the July cold, or middle form, which links together the early form, or June cold, with the later form or autumnal catarrh. The disease may exist from May until November, and indeed, all the year round in some cases. All the different forms are essentially one disease, whenever occurring. The disease is therefore an unity, there being no distinctions in symptoms or character between the early and middle forms. Dr. Beard claims that this theory accounts for all the phenomena of the disease. The treatment is by sedatives and tonics, such as arsenic, belladonna, nux vomica, cold, powdered camphor, the bromides, choral, electricity, Turkish baths, etc., and by this treatment nearly all cases can be relieved. —Ed.]

Symptoms.—The disease assumes two forms—the catarrhal and the asthmatic. The first is the lighter form, and runs its course with comparatively little trouble to the patient. The first symptom is a tingling in the nose, with a clear watery discharge from that organ, attended by violent sneezing occurring in paroxysms, sometimes with a profuse flow of tears. The mucous membrane of the nose swells, sometimes so that the nostrils are closed; but this usually passes off during the night, to return again the next day. With the swelling of the mucous membrane of the nose the excessive irritability of that organ ceases. The discharge, as the case progresses, may become slightly bloody, and later, thick and pus-like. The attack now and then begins in the eyes, with symptoms similar to those in the nose; but, at any rate, the mucous membrane of the eyes (*conjunctiva*) becomes swollen and inflamed, with profuse secretion of tears in nearly every case as it advances. The lining membrane of the mouth and throat (*fauces*) usually shows some signs of inflammation, such as tickling, sense of dryness, and redness on inspection. The catarrhal inflammation may extend as far as the Eustachian tubes (leading to the ears), even to the extent of developing a temporary deafness.

The asthmatic form generally presents more serious, even alarming symptoms. The asthma is of many degrees of severity: from the lightest cough and expectoration, to great difficulty of breathing (*dyspnœa*), croupy inspiration, with anxious and disturbed expression, the patient sitting erect, clenching the hands, and making violent respiratory efforts. In these more severe forms, a more or less active fever presents itself, combined, in severe asthma, with very rapid pulse. This form is sometimes attended with chills.

This disease may be distinguished from nervous asthma by the attacks of hay asthma occurring in the day-time and in the fresh air, and the tendency to persist during the season favorable to the disease. The attacks last from three to six weeks, and reach a spontaneous cure with remarkable rapidity as the season closes. Blackley says that the intensity of the disease depends upon the quantity of pollen floating in the air, and the sensitiveness of the patient.

Treatment.—No form of treatment has been discovered which appears to exert any control over the disease. The surest form of treatment is a change of residence as soon as the attack declares itself. Any of the regions in which the disease is known to be excluded will exert a curative, or at least favorable influence over the disease. The White Mountains, the Adirondacks, and the region of the Great Lakes, are favorite places of resort for those who are yearly liable to attack. Wyman says that quinine has been more successful than any other drug. It should be commenced at least four weeks before the expected attack, and taken to the amount of two to three grains before each meal, and continued during the attack. Arsenic, in the form of Fowler's solution, in two- to three-drop doses after each meal, is said to exert a favorable influence. The bowels should daily be slightly acted on by laxatives like Congress water or citrate of magnesia. Local applications, like colored glasses, to protect the eyes, cold water to the eyes and nose, or a solution of borax (biborate of soda), will afford comfort to the patient. A five or ten grains Dover's powder will add much to comfort during the night. A chlorate of potassium solution* used as a gargle relieves the throat as much as anything that can be used.

For the asthma, smoking stramonium leaves has been used with fair success. A secret remedy composed of three parts of these leaves and one part of saltpetre, the fumes of which are to be inhaled while burning, has had considerable reputation. The Espic cigarettes, composed, according to Wyman, of—

Belladonna	leaves	four and a half grains.
Hyoscyamus	"	two and a half grains.
Stramonium	"	two and a half grains.
Phellandrium	"	three-fourths of a grain.
Opium	"	one-fifth of a grain.

Powdered and rolled up in paper.

Two cigarettes are to be used during one attack. Paper saturated

* [Made by adding a drachm to three or four ounces of water.]

with saltpetre, and its fumes inhaled while burning, is a popular remedy.

The patient should have a nourishing diet, avoid dust, smoke, and night air, and wear flannel next to the skin.

Malarial Fevers.

We shall consider under one head the general cause of the different fevers of this type. It is difficult to give a brief popular *résumé* of the latest form of scientific thought upon this interesting and important matter. In this group of fevers we have a very strong confirmation of the germ (contagium vivum) theory of disease. The disease, in some of its various forms, is generally more or less confined to particular regions (*endemic*). It sometimes becomes generalized, and prevails extensively among a people (*pandemic*). Marshy regions, or countries liable to extensive overflows of water, are the usual seats of the morbid cause. Salt-water marshes, as where fresh and salt water mingle at the flood of the tide, are more noxious than fresh water alone. This is supposed to be due to the sea water killing the fresh-water plants, and causing poisonous emanations from the decomposing matter. Many instances are noted in which the most favorable conditions for the development of malarial poison exist, and yet the locality is perfectly free from the disease. These exceptions are not accounted for. When marshy regions are perfectly drained, or when malarial districts pass under cultivation, the disease generally disappears, or exists in a modified form. Malarial regions have been rendered innoxious by the cultivation of sun-flowers (Maury); the cultivation of the sweet flag (*Acorus Calamus*) has been attended with the same result. Malaria is known to exist under other conditions than in marshy places. In extensive overturning of the earth, as in building canals and fortifications, in clearing off the forests and bringing new lands under cultivation, intense forms of fever have been developed. Under conditions not yet explained, malaria may exist in very elevated and dry regions, as, for instance, in the Tuscan Apennines, at the height of 1,100 feet; on the Pyrenees, at 5.000 feet; in Peru, at 10,000 and 11,000 feet; and on the island of Ceylon, at 6,500 feet. Hertz thinks that it is proven that in an elevated and dry region, with a stratum of loose soil overlying clay, or other impermeable soil, when a large amount of surface-water charged with vegetable matter percolates through the surface and is retained by the impermeable stratum, a condition favorable to malaria is induced.

It is established that a certain degree of heat is essential to the

development of malaria. The north and south limits of the disease are 63° of latitude of the first, and 57° of latitude of the latter; or north, by the isothermal lines of 59° to 59.8° Fahr. The disease generally prevails during the hot months, and summers of unusual heat will often develop malarial poison of such unusual intensity that it will break loose from its endemic haunts and invade regions usually free from the disease. The same is true of tropical malaria. The fever of Zanzibar prevails from March to May, and on the Guinea coast from June to October. In temperate zones August and September are the malarial months; and in countries in which the snow melts off in February, outbreaks of malarial disease may be expected as early as May. Jilek demonstrated that in the excessive malarious district of Istria the extent of malarial diseases corresponded to the amount of the rainfall.

Marsh-fever poison may be spread by the wind. The malarious germs extend from an endemic centre in the direction of the prevailing winds.

No race or nationality is exempt from the disease. The negro race is not exempt even in its native haunts. On the Gold coast of Africa, for instance, to a careless observer they may appear so, compared to the white race exposed to the fatal malaria of that country. All periods of life are equally subject to the poison. It may be modified, however, in its expression by age and sex. Children may suffer from intermittent bowel complaints, youth to the continued form of fevers, and middle life to the more typical forms of intermittent. Men are more subject to the febrile forms of malarial poisoning than women, probably from their more exposed occupation, while in women the poison often assumes the form of neuralgias, especially of the nerves of the face (trigeminus nerves). The condition of the system has much to do with the predisposition to attack. Causes which seriously disturb the nervous balance—anger, fear, sleeplessness, hunger, fatigue, and excessive mental exertion—may predispose the system to attack. Exposure to the air at night, sleeping in damp beds, or sleeping on the lower floor of a house, living in dwellings too densely shaded, may favor the onset of the disease in some of its protean forms. Weak and anæmic persons are more liable to attack than those in robust health. Residents of malarial regions are sometimes suddenly attacked by the malarial fevers on removing to a cool, elevated country. Any sort of cooling down, especially after overheating, exposes one to an attack after exposure to the poison. [Exposure to the direct rays of the sun is liable to bring on an attack of malarial fever in those who are subject to it.—Ed.]

The malarial poison may, in a certain manner, remain dormant

or latent in the system, with or without a previous attack of fever. A person once having an attack of fever may suffer repeated attacks for months, or even years, after removal to a non-malarial country ; or a person may suffer an attack, after a residence in malarial districts, months after his removal to a healthy region. It is possible to gain a certain immunity by acclimation. Strangers are more liable to attack than old residents. Acclimation does not give anything but an accommodation of the system to the morbid cause.

Simple Intermittent Fever—Ague—Chills and Fever.

Symptoms.—This form of malarial fever may be preceded by premonitory signs, such as forehead headache, a sense of languor, loss of appetite, and profuse sweating at night, with a bad, bitter taste in the mouth, and the tongue coated white around the edges and yellow in the centre, the urine scanty and high-colored. This condition lasts from six to eight days.

Following these signs we have the first stage of the fever—the chill.

The chill may vary from the slightest shudder to trembling of the body and chattering of the teeth ; with the chill is severe backache, pain in the head ; the face is pale and shrunken ; the hands and finger-nails become blue and numb, and the body covered with "goose-flesh" (*Cutis anserina*). Nausea is often present, and if food has been recently taken there may be vomiting. The pulse is small, frequent, and hard ; respiration rapid, and mental disturbance ranging from mere agitation to active delirium may be observed. Notwithstanding this appearance of cold, the thermometer placed in the mouth, armpit, or bowel, shows already the presence of fever. The duration of the chill is from a few minutes to several hours.

The hot stage follows and gradually culminates. As the chill subsides, flashes of heat travel from the extremities toward the trunk ; this sensation recedes, followed again and again by the feeling of invading heat, until the fever is fully developed. The intense pain of the chill is partially relieved, but the heat-pain becomes very severe ; the blood-vessels of the temples and neck throb violently. The face glows with heat ; respiration is quick, the pulse hard and rapid. The patient is restless and excited, and often delirious. This, the febrile stage, lasts from three to twelve hours.

The sweating stage follows and develops gradually as the fever declines. All of the distress and pain subsides, and during the

sweating stage the patient falls into a quiet sleep. The urine becomes free, and throws down, on cooling, a brick-dust sediment.

After this stage the patient often feels quite well and returns to his duties; but sometimes, especially in lengthened stages, the head is a good deal disturbed, the tongue is coated, the stomach bloated, and the bowels irregular, while the skin is sallow. The region of the liver and spleen are usually sensitive to pressure. Occasionally there is a slight fever toward night, with disturbed rest. In prolonged intermittents the fever in this manner may pass into the remittent form.

This is the typical course of events. There are many deviations from it, but they do not alter the general course of an intermittent fever.

Following these three stages is a period of intermission (*apyrexia*). The length of this intermission defines the type of the fever. When the attacks recur every twenty-four hours, we have a *quotidian* fever; when an intermission of forty-eight hours exists, the fever is *tertian* or every third day, and with one of seventy-two hours the fever becomes *quartan*. In temperate climates the fever is usually tertian in form. Rare forms of the disease are those in which the paroxysms recur every fifth, sixth, or seventh day, and so on, to even the thirtieth day; and the double types, as double quotidian, double tertian, and double quartan.

Remittent Fever.

Symptoms.—The lightest form of the disease is commonly known as *bilious fever*, or *bilious remittent;* sometimes, with highly irritable stomach, the disease is termed *gastric remittent.*

The attack begins suddenly with a chill, followed by loss of appetite, nausea, sour stomach, headache, dizziness, and sleeplessness. Diarrhœa and jaundice are generally present. The fever, after a course of four to twelve hours, gradually declines in a sweating stage, in which the patient feels considerably relieved, but during which the fever continues, to return to its full force at an uniform hour daily. This is termed the *remission.* The recurring fever may be preceded by a slight chill, but the usual form is an increase of the fever without a chill. The duration of the attack is from three to ten days, or the remittent may pass into the intermittent form. In occasional cases the jaundice and colorless stools persist for some weeks after the conclusion of the attack.

A more severe grade of remittent begins in the same manner as the above in a more aggravated form, with only marked remissions in the earlier stages, and after a few days assuming nearly a

continuous form. At first of a vigorous form, the disease drifts into a typhoid or depressed (*adynamic*) type. Serious complications, such as convulsions of various character, profound insensibility (*coma*), dysentery, pneumonia, and inflammation of the spleen, are liable to arise. The attack generally ends in about two weeks in marked remissions and sweats, or passes into a simple intermittent.

A still more severe form is the *fever of the tropics*. The pernicious character of this kind is shown from the beginning of the attack; the extreme prostration, the early condition of apathy, and a tendency to collapse, define the danger. The early stage, oftentimes, instead of drifting at once into the continued form of fever, shows indefinite and irregular increase of fever and remissions, which gradually drift into a low, continuous form, and the patient falls into an apathetic condition, and dies in a condition of stupor. Of this character is the *Chagres fever*, and the highly fatal fever of low tropical coasts and deltas.

Another form long known, and not yet fully defined, is a *bilious remittent*, characterized by jaundice and bloody urine, and commonly known under the French name of *fièvre bilieuse hématurique*. The fever is known only in the most malignantly malarious districts of the tropics, and then only during the prevalence of a malarial epidemic.

Irregular Forms of Malarial Fevers.

Under this caption we may arrange a number of anomalous fevers of this origin, some of which are, however, quite common.

A form of fever quite generally common throughout the United States is one described under the name of *typho-malarial*. There is much confusion in the description of this fever; even in the reports of army surgeons in the late war of the rebellion, with whom the disease must certainly have assumed its most typical form, there is much conflict of description. Very often the disease is but a degeneration of the simple intermittent toward the continued form.* The fever and chill may be both slight and of irregular sequence; and yet there are grouped about these two conditions, of which the latter is not essential, a few well-marked

* [By one class of observers, also, the term has been employed to indicate the presence of malaria, and also of a *septic* poison, such as sewer-gas, which differs from the specific poison that gives rise to typhoid fever. There is yet another class of observers who doubt the existence of such a form of fever, and regard the so-called typhoid element as nothing more than a "typhoid condition"—a low condition, liable to be developed in connection with remittent fever, as well as many other diseases.—Ed.]

typhoid symptoms. [See page 14.] The tongue has a dark, thick coating down the centre, with red edges and tip; there is more or less intestinal irritation, complete loss of appetite, and rapid emaciation. The fever is of a most irregular character, often showing distinct remissions; often these are wanting, however, or so slight as to require careful observation with a thermometer to show the fact. The remission, or partial subsidence of the fever, sometimes lasts several days, the patient meanwhile not making any gain in appetite or strength.

The mind is clear, usually slightly apathetic; the stomach critical, but rarely so irritable as to reject its contents. Sometimes the disease prevails epidemically, like the outbreak of typho-malarial fever in Central New York in the spring of 1878. The fever of the same name, observed by army surgeons, was essentially different, due no doubt to the exposures, fatigue, and unhygienic life of the army.

The course of the disease is not uniform: two to five or six days is oftentimes the duration of the attack, or it may persist as many months. A slow and varying convalescence terminates the attack, with a marked tendency to relapse.

The *malarial cachexia* is a term used to describe the general break-up of the health from malarial poisoning. Hertz applies the word *intoxication* to this condition of the system. The symptoms are loss of appetite, metallic taste in the mouth, a disposition to vomit, and gas in the stomach, a yellow coating upon the tongue, dryness of the throat and mouth, and a feeling of pain and weight in the stomach, with rumbling of the bowels. Usually there is a tendency to diarrhœa. There are marked nervous disturbances, such as dizziness and derangement of vision, tickling and burning in the feet and hands, and pain in the shins and lower part of spine. Debility is marked, and the patient fancies himself very ill. This light form of malarial poisoning soon passes away on the removal of the cause, and is generally promptly removed by treatment, although relapses are frequent.

A pernicious form of malarial poisoning is described, but is happily rare. This is called *pernicious fever*. It gets this name by being specially dangerous from involving important organs. This form is usually intermittent. One of the most frequent complications is that of the nervous system. Excessive headache, dizziness, and confusion of speech are its signs. After the chill, which is liable to be accompanied by convulsions, the patient falls into stupor and profound unconsciousness. He lies in this condition for many hours, with hot, flushed face, dilated pupils, and folded limbs. The attack ends in a profuse sweating stage. If

the patient survives the first chill, he usually dies in some of the succeeding ones.

Another form is that resembling *cholera*, and is so called. In this we have profuse watery evacuations during the fever, cramps in the limbs, coldness, vomiting of yellowish fluid, and great thirst terminating in collapse.

Yet another form is the *cold* (*algid*) *intermittent*. The attack begins with a chill, but it is not until, or after, the resulting fever that the patient grows cold. The body becomes excessively cold; the temperature in the armpit being 84° Fahr., instead of the natural temperature, 98½° Fahr., while the mouth shows a temperature of 86° to 88° Fahr. The pulse is about forty, and the respirations as low as ten to the minute. The patient is conscious throughout, but is very apathetic.

There is a *hemorrhagic form*, characterized by loss of blood from the bowels.

The attack known as *congestive chill* must also be classed among these forms of pernicious fever. The danger in these attacks occurs during the chill, and consists generally of sudden and fatal congestion of the lungs. The author remembers seeing a case of this kind in Louisiana, which was appalling in the speed and agony of the death which followed.

These forms of malarial poisoning are rare in the temperate malarious regions, and, as a rule, are seen only in those of the tropics. The congestive chill occurs in the southern part of the United States, and is even here, happily, but rarely met with.

Treatment.—So widespread and prevalent are malarial diseases in some of their many forms, that for once we can depart from our rule and make treatment more important than prevention. The treatment of simple intermittent may be divided into stages.

The *cold stage* requires but little attention. Avoid deluging the patient with hot drinks and stimulants, as these means will not cut short the chill. Stimulants must also be given with care, or not at all. A bed well warmed, and friction to the body and limbs, are all that is usually required. In case collapse is threatened, stimulants (wine or whiskey) may be given freely, warm applications, or mustard drafts to the feet and body may be used.

In the *hot stage*, cooling drinks in small quantities, cold sponging, cold to the head, if there is much disturbance thereof, is about all that can be done. We must remember that the fever is self-limited.

The *sweating stage* requires no special treatment. The patient is better left alone. It is well to change the dress and bed linen after this stage is concluded. [When the perspiration is profuse

and long-continued, drying the skin with warm towels will help to arrest it.—Ed.]

The real treatment is during the intermission. The one drug that has gained universal use is quinia, usually in the form of the sulphate. Small doses should be avoided, and ten-, fifteen- or twenty-grain doses be given in such a manner that the last one is taken about five hours before the anticipated chill. Two doses of one of the above quantities are usually sufficient. One full dose is generally sufficient to prevent a relapse. In case the patient is becoming debilitated, the persistent use of quinia is indicated—about three or five grains three times daily. Children from ten to fifteen years of age should be given about six grains at a dose, and of younger age, a single dose of four grains, or two doses of two grains. When the stomach rejects the drug, or in cases of pernicious fever in which it is desirous of producing a profound impression on the system rapidly, the drug may be injected in neutral solution under the skin. It may also be given by injection into the lower bowel, but is liable in the latter case to produce purging. Sulphate of cinchonidia is now being largely used in place of quinine. To produce the same effect the dose should be about one-fourth larger.

The treatment of the pernicious forms must be governed by the special indications in each case. In these cases alarming symptoms crowd one on the heels of another and demand the best skill and energy of a physician.

In regard to the administration of quinia in the other forms of malarial diseases described above, nothing can be added of a popular, practical character to the above method. All forms of the disease should be regarded as sufficiently serious to require the counsel of a physician.

Among *preventive measures*, drainage, cultivation of the soil, pure drinking-water, avoiding exposure to night air in swampy districts, high and dry sites for dwelling-houses, avoiding all excesses, liberal diet, the prompt attention to any state of ill-health or depression—above all, avoiding known malarial regions, may be mentioned. If obliged to reside in these districts, quinine as a preventive should be resorted to in two- or three-grain daily doses. The surface-water of swamp lands ought not to be drank under any circumstances without having been boiled.

The counter-influence of certain forms of vegetation on the malarial poison has been already referred to. The growth of the sun-flower and *Acorus calamus* (sweet-flag), has long been known to modify a malarious condition of the atmosphere. In the last ten years marked attention has been drawn to the sanitary effect of planting the *Eucalyptus globulus* in malarial regions. All ac-

counts show that the growing trees, in any number, greatly lessen or modify the poison. This tree is a native of Australia, grows to a great size, has large leathery leaves rich in volatile oils. The leaves have the peculiarity of growing upright, so that both sides are equally exposed to light and air. The oily extract from the leaves has been used internally in malarial diseases, with the result of curing eighty per cent. of the cases.

It seems proper to guard the general reader against some wrong conclusions, that seem, at present, very popular, namely—quinine never enters the bones, or causes rheumatism, or loosens the teeth, or produces permanent deafness in either its curative or preventive use in malarial diseases. Many of the ill feelings following a course of malarial disease, which are regarded as the result of the free use of quinine, are the after-effects of the disease itself—the malarial intoxication—and call for the further use of the drug.

In this popular account of these diseases the writer has thought best to omit mentioning doubtful means of treatment.

Influenza, or Epidemic Catarrhal Fever.

Cause and Natural History.—Under these names is described an epidemic disease defined by a catarrh of the respiratory organs, and often of the digestive organs also, accompanied by rapidly developed weakness, headache, and pain in the limbs, with more or less fever.

The disease is noted for the vast extent of territory over which it will expand epidemically. It prevails independently of the atmospheric conditions which are known to favor catarrhal diseases, and is believed to depend upon miasmatic influences, the special form of which is not understood. The disease was first noted in 1510. Outbreaks of it occur in any latitude, and at any season of the year. The disease generally advances in epidemic waves from the east and north-east to the west, or, more rarely, radiates from an epidemic centre; occasionally several of these centres exist simultaneously at widely separated points.

Epidemics of this disease develop usually with explosive violence, so that in twenty-four hours, the inhabitants of whole cities, or wide extents of country, will be prostrated by the influenza; while the decline is generally as rapid as the rise. Epidemics last from one to three months as a rule. No attempt is now made to prove the contagiousness of the disease. It attacks all ages and sexes; first women, secondly males, and lastly children. This is especially true of some epidemics, but not of all. Nothing is known concerning the exciting cause; but, whatever the morbid essence may be, the atmosphere is probably the agent of its diffusion.

Symptoms.—The beginning of the disease is defined, usually, by a chill, or chilly sensations, alternating with flashes of heat, lasting for a few hours, very rarely for more than a day. The fever is sometimes quite marked, even when the disease is of a light character; it is remittent rather than continuous, and is worse at night.

The catarrhal symptoms develop early, and involve the mucous membrane of the head, throat, and lungs. The discharge from the nose is profuse and irritating; the eyes are bloodshot and overflow with tears; the throat is sore, the voice hoarse, with tickling in the throat; cough from the onset is troublesome, dry, and spasmodic, often disturbing the patient at night. In many patients this is accompanied with difficulty of breathing, pain in the chest, or catching pains or stitches in the chest-wall. The prostration of the strength is very marked, and the patient quickly takes to his bed from an overpowering sense of exhaustion. In addition, there are nerve-pains (or neuralgias) in the limbs and at the root of the nose. In some epidemics, there is sleeplessness and mental irritability, and in others apathy and drowsiness.

In uncomplicated cases the end is recovery, and the duration of the attack is from three to five days, terminating generally in a gradual subsidence of the symptoms. Occasionally the recovery is not complete, but is retarded by general debility, coughs, or severe headaches, and impaired appetite. Influenza is, however, often fatal to aged people, and in those who are debilitated from chronic diseases.

Treatment.—In ordinary cases the treatment should be mild. Rest in bed; warm foot-baths; mustard plasters, and gentle stimulation, or warm drinks to promote perspiration, with frequent doses of muriate of ammonia in solution (one drachm to four ounces of water), a dessertspoonful every two hours. These are usually sufficient. Five to ten grains of Dover's powder in case of pain, and inhalations of vapor of warm water, will add to the comfort of the patient. In cases of aged people, or in those greatly debilitated, the patient must be carefully watched, and stimulants and tonics early resorted to. Violent cough in such subjects ought to be allayed, for which an excellent prescription is:

Powdered muriate of ammonia	Thirty grains.
Sulphate of morphia	Three grains.
Tincture of blood-root (*Sanguinaria canadensis*)	Four drachms.
Syrup of ipecac	Four drachms.
Syrup of liquorice	One ounce.

To be mixed in two ounces of water, and to be given in teaspoonful doses every three to six hours.

Diarrhœa, which may be occasionally present, can be controlled with small doses of Dover's powder, or of Tully's powder (five grains), given in a little cold water. Inunctions of oils or glycerin over the nose gives considerable relief to breathing. If the fever should prove persistent, quinia in three to five-grain doses should be given every five hours, or it may be of use as a tonic, in two to three-grain doses, given thrice daily.

Nothing, scarcely, can be said about preventive treatment. Aged persons and consumptives should be guarded against exposure, and confined to their rooms during an outbreak of an epidemic.

Epidemic Dysentery.

Cause.—Dysentery of the type defined in this chapter is an epidemic disease of the tropics, or of camp-life. This epidemic dysentery does not differ, in the manner in which it affects the bowel, from that which might be caused by irritating food, or from poisons, acids, or arsenic. Moisture and high temperature favor the development of the disease, or rather of the peculiar miasmatic tendency; for evidently a certain miasmatic factor is necessary, since in some tropical climates the disease is not known, notwithstanding other conditions are favorable.

The majority of writers deny that the disease is contagious, but Huebner thinks there is a limited contagion by means of the excretions, and every dejection of a dysenteric patient must be considered as dangerous. Certain articles of food predispose to the disease. When torpidity of the bowel exists, as it generally does before the onset of the disease, it permits lodgment of the food in the irregularities of the large intestine, and thus induces a catarrh of the bowel.

Symptoms.—The disease begins in a simple diarrhœa, which lasts from three to five days. The symptoms then become urgent; there is abdominal pain, a constant desire to evacuate the contents of the bowel (*tenesmus*), which consist mostly of thick mucous streaked with blood, and which, as the disease advances, becomes bloody mucous, or pure blood. The fever is moderate and of a remittent type, with headache, dizziness, and thirst. The bowel-symptoms have daily periods of remission, the early part of the day being comparatively free from straining, which generally comes on to torment the patient during the night.

In mild cases the end is recovery in from eight to ten days. In severe cases the symptoms gradually augment and the patient succumbs to exhaustion. Sometimes the case terminates in chronic dysentery, which may linger for months, or even years. The dis-

eased changes (*pathology*) consist usually of a catarrhal inflammation proceeding to ulceration of the large intestine. The death ratio of tropical dysentery varies from twenty to eighty per cent.

Treatment.—The disease gives way better before a mild laxative treatment than any other. It is well to begin with an emetic dose of ipecac (fifteen to twenty grains of the powder in warm water), followed every other day by cathartic doses of castor oil (one ounce). Soothing injections greatly relieve the pain, burning, and tenesmus of the rectum, such as linseed or slippery-elm tea, or of starch and laudanum (one to two drachms of the latter to each enema). Injections of very warm water are usually grateful and beneficial. The diet should consist of milk, uncooked beef-juice, strong soup, soft-boiled eggs, milk porridge. Cold drinks should be avoided, as they usually cause griping pains in the large intestine. Stimulants are to be avoided. The patient should be kept warm. All evacuations are to be at once carefully destroyed, and vessels and linen disinfected with chloride of lime or carbolic acid, and the room thoroughly ventilated daily.

Epidemic Cerebro-Spinal Meningitis—Spotted Fever.

Cause.—Nothing is known of the original source of this disease. All writers now admit that it is infectious. It prevails in temperate regions and not in the tropics, and generally in the winter and spring. Childhood shows a marked susceptibility to the disease. Attacks are favored by bad hygienic surroundings, such as damp, overcrowded, ill-ventilated living and sleeping rooms, and the saturation of the soil with the results of decomposition.

Whether the disease originates in a miasm or contagion is not yet settled. Ziemssen's idea, which is the most acceptable, is that the specific poison is a "morbific germ, which primarily arises in the human body, and infects healthy neighbors only when it has undergone a certain, still unknown modification by means of cultivation in suitable intermediate individuals." This does not imply contagion in the sense of small-pox or typhus.

Symptoms.—The disease begins abruptly and with symptoms of serious sickness—chill, high fever, terrible headache, and vomiting, which is repeated whenever the patient gets up. In the more serious cases loss of consciousness is observed from the first, or a deep stupor, delirium, convulsions, and stiffness backward of the neck ; sometimes the whole muscular system of the back is in a continuous (*tonic*) spasm. The fever is often moderate, and of no particular type. The skin becomes highly sensitive to external impression (*hyperæsthetic*), so that every touch and movement of

a limb elicits expressions of pain. The pain in the head is terrible, so that even in unconsciousness the patient strikes the head with the hands. Then follow eruptions upon the skin ; first, like cold-sores (*herpes*) upon the face, then irregular red patches (*erythema*) upon the body, flea-bite spots (*petechiæ*), or like prickly-heat (*urticaria*). The eruption is not always present. About the third day the tongue becomes dry and cracked, the bowels are constipated, rarely is there diarrhœa.

When the attack is to end in death, nervous irritation subsides, and the signs of depression increase; complete unconsciousness, involuntary evacuation of the bladder and bowels, extremely high fever, rapid pulse—too much so to be counted. Toward the end convulsive movements in the limbs, paralysis of the nerves of the face, or of one-half the body, profound stupor, and death are the usual order of events.

In case of a termination in recovery, the irritability of the nervous system continues, with pain on the slightest movement; the eyes are painfully affected by light, and the ears by noises; the vomiting ceases in five or six days; the headache and stiffness of the neck gradually diminish, and convalescence begins in one or two weeks, and may be very protracted from the extreme emaciation and nervous disturbance.

Varieties of the disease are the *fulminant*, or *explosive*, in which death ensues in a few hours; and contrasted with this the *abortive* forms in which the attack is slight and undergoes a spontaneous recovery; the *intermittent* form, and the *typhoid epidemic* variety, none of which require for our purpose here more than mention.

Examinations after death show that the force of the disease is expended upon the brain and spinal cord, the envelopes of which (the *dura mater* and *pia mater*) are congested and inflamed, while the substance of these parts exhibits rupture of small blood-vessels and softening.

The mortality for all ages will average about forty per cent., the larger share of which occurs in childhood.

Treatment.—The treatment of this severe disease is designed to meet the symptoms as they arise. The intense head-pains are very much relieved by ice-bags to the head and back of the neck; and the same application along the spine assuages very considerably the stiffness and pain in this region.

Removing small quantities of blood by means of leeches or cups from the back, neck, and temples, gives temporary relief. The use of general blood-letting and mercury, although resorted to, is of doubtful utility. Quinia is of no particular use except in doses of fifteen to twenty grains to control high temperature; but as mod-

erate fever is the rule, and as the temperature does not become excessive except toward a fatal termination, there is but scant opportunity to use this drug with good results.

Opium and morphia (its active principle) are remedies of great value in this disease. It is not rare to hear it popularly said that "pain never kills anybody," but those who say this, little know the disastrous consequences of persistent and excessive pain. It is better to give the morphia hypodermically in one-eighth-grain doses repeated every one to two hours, if it is not well tolerated by the stomach. In this manner a few hours of quiet sleep may be gained each day. Ether applied in the form of spray upon the back of the head and neck, and along the spine, acts both as a powerful cooling agent and a local anodyne.

At a later stage in the disease, iodide of potassium, in three- to five-grain doses every five hours, is a powerful agent in causing absorption of the inflammatory thickening of the envelopes of the brain and spinal cord. The inflammation of the brain sometimes results in deaf-mutism in children under three years of age, or loss of sight, or dropsy of the head in older children or adults, as results of the attack, treatment of which conditions is very nearly hopeless.

The diet should be concentrated fluid nourishment given in small and frequent quantities during the height of the disease, resorting to solid food when convalescence is established.*

Epidemic Diphtheria.

Cause and Natural History.—Isolated cases (*sporadic*) will be considered here in connection with the epidemic disease, since such cases do not essentially differ from the latter in their course and treatment.

The idea has, in some way, become popular that diphtheria is a comparatively modern disease; the contrary is true. It is one of the oldest known epidemic diseases. Diphtheria is, according to Oertel, whose general description we are following, a *miasmatic contagious* disease. It occurs in isolated (*sporadic*) cases, as well as epidemically, and may be restricted to a locality (*endemic*). Statistics hitherto show that soil and drainage have but little if any effect upon the origin and course of the disease. The seasons are of some influence, as the mortality is greatest during the fall, winter, and early spring. Hygienic relations have a marked effect. Poverty and uncleanliness; crowding of many people in

* See, also, the Chapter on the Nervous Diseases of Infancy and Childhood.

damp, ill-ventilated living or sleeping rooms; the emanations from privies, sewers, and manure-heaps, are favoring conditions. Crowded work-rooms or factories, school-rooms, and orphan asylums are favored fields for the operation of the contagion.

That the disease may be diffused by actual contact with affected persons is well proven. It may, however, be communicated by the peculiar miasm, or epidemic tendency. It will thus infect various persons in the same house or family in which a case of the disease has existed; it will also attack other families who have not been in such relations with an existing focus of the disease. The first is an instance of contagion; the other of epidemic tendency. The disease has been successfully inoculated upon the mucous membranes of animals. The virulence of the contagion depends upon the severity of the case in which the specific poison had its origin. This is only true generally, as a light case may induce a fatal attack. This difference may be explained by the predisposition of the individual to the diphtheritic inflammation. This contagion may be carried through the air, or be diffused by the exhalations or secretions of the patient. The poison may cling to certain places, houses, or rooms, in which the disease may break out sporadically after long intervals. The existence of catarrhal inflammation of the mucous membranes of the head and throat is thought to increase the liability to infection. This liability is greatly increased in children; adults take the disease, but not so readily or severely. An attack of the disease affords no immunity against a second attack; on the contrary, it seems to render many persons liable to a renewal of the attack.

Recently the disease is supposed to hold certain relations to minute forms of vegetable organisms. These forms are so minute, that Oertel says they are upon the very border lands of the visible. These organisms are commonly known as *bacteria*, of which there are several forms. One of these, the spherical bacteria (*micrococcus*) penetrates the tissues wherever a diphtheritic membrane appears; another form is the rod-like bacteria, found only in the mouth and fauces. These are the two principal organisms that hold an important relation to the disease; several other forms are observed, but are not yet classified.*

The facts noticed are these: when lower and less active forms of minute vegetative life (*leptothrix buccalis, oidium albicans*) are found in simple ulceration, catarrhal or otherwise, in the throat and mouth, round and rod-like *bacteria* quickly crowd out and destroy them when diphtheria occurs; and when the false mem-

* See page 7 for description and illustrations.

brane is cast off and diphtheritic inflammation subsides, the higher forms of bacteria disappear, while the lower return. These parasites are not the bacteria of decomposition, for those of diphtheria when inoculated into animals multiply with wonderful rapidity, and produce serious illness, while those of decomposition, when inoculated, form generally local abscesses. These vegetable parasites are not a matter of accident, but are inseparable from the diphtheritic disease. Eberth says, "without *bacteria* (*micrococci*) there can be no diphtheria."

The incubation of the disease is variable, and depends upon the intensity of the infecting force. Between the lodgment of the germs upon the tissues, and the local evidence of the disease, a period of about forty-eight hours exists.

Symptoms.—I shall first describe the lighter or *catarrhal* form. The first evidence is a slight feeling of indisposition, which in grown subjects is generally not regarded, followed by a dryness of the throat and pricking pain in swallowing, and slight swelling of the tonsils. On inspection, the palate and throat (*fauces*) appear of a vivid red, while the mucous membrane appears thickened. The next event, after an interval of a few hours or a day, is the appearance of small white or yellowish-white spots arranged in groups or irregular circles, on the tonsils. In the more active cases, slight fever, 102° or 103° Fahr., lasting two or three days, occurs with pain in the head and dulness of the intellect.

In the course of twenty-four hours or more, the redness of the throat lessens, as well as the puffy look of the mucous membrane, while the points covered by the membranes become dirty yellow in appearance, standing out upon the general surface. On the third or fourth day, the false membrane becomes detached, and the case is practically over. In more severe forms the fever persists longer, the glands in the neck and under the jaw become slightly enlarged and tender, while the redness of the throat and adhesion of the membranes persist. From the fourth to the sixth day, a sudden increase of the fever is noticed, ranging from 103° to 104° Fahr., with high pulse and hot and painful head. Dryness, burning in the throat, pain in swallowing, and a rapid extension of the false membrane are observed. The general symptoms are evidence that the system at large has become infected; and in this manner the *catarrhal* may become the *croupous* form of the disease.

The *croupous* form begins with marked fever, resembling the early symptoms of scarlet fever, headache, the back and limbs are painful, and there is prostration, vomiting, restlessness, or drowsiness—the latter especially with children, together with dryness of the throat and pain in swallowing. The glands of the neck and

under the jaw become tender and swollen. At this stage the throat becomes red, the mucous membrane having a puffed, bloated look, glistening as if varnished, while the tonsils and deeper parts become greatly enlarged. But a few hours are needed to develop a false membrane, either in groups or extensive patches, first over the tonsils, and then gradually extending over that portion of the throat seen through the open mouth. In the course of ten or twelve hours the swollen mucous membrane has assumed a dirty, or grayish-white color, and the membrane has become thick and leathery, and may be removed in strips, leaving a raw-appearing mucous membrane beneath, which is generally covered with a layer of pus after twenty-four hours or so; or, after about the same interval, by a renewal of the false membrane.

During the progress of the disease, the general and local symptoms do not always run a parallel course; the local disease extends, while the fever subsides, and the patient is lured into a false idea of recovery. In the same way, pain in swallowing, and soreness in the throat may diminish while the exudation is slowly extending into the great air-passage of the throat (*larynx* and *trachea*). Usually, however, the fever and general disturbance increases with extension of the local condition. In addition to an extension of the inflammation, a large quantity of semi-fluid, sticky mucous is secreted, which, unless the mouth and throat is carefully cleansed with disinfecting gargles, becomes intolerably offensive.

As the false membrane extends into the larynx, the symptoms of obstructed breathing come on, which are so terrible to witness in young children, and which may prove fatal by suffocation. The invasion of the larynx occurs early—usually in three to five days. The symptoms of croup may be the result of thickening and infiltration of the mucous membrane of the opening of the upper air-passage, and not from the membrane.

Albumen is noticed in the urine in about two out of every three cases of diphtheria, and is a useful guide in removing doubt in a suspicious case of sore throat.

In severe cases, usually, a new danger arises from poisoning of the system by absorption of the decomposing secretions of the throat. These cases are defined by the extreme offensiveness of the breath, the great rise in the fever, and signs of extreme prostration, while the glands of the neck become enormously swollen. Recovery from this form is very rare.

Secondary affections are paralysis of the muscles of the palate, impairment of vision and, more rarely, paralysis of the arms and legs. These effects of the attack are developed slowly, not usually

earlier than the second or third week, and even so late as the fortieth day. The ordinary termination of paralysis caused by diphtheria is in recovery, in light cases in from six to eight weeks, and in the more severe, in as many months.

Every well-marked case of diphtheria must be looked upon as dangerous to life, until it ends in recovery. This is invariably the rule in children. Isolated (*sporadic*) cases are more favorable than those occurring in the epidemic variety of the disease. The mortality of different epidemics ranges from thirty to forty per cent., the rate of mortality increasing in proportion to the number of children attacked. In children the outlook is always of the darkest character, while in adults, good health and constitution usually enable the patient to recover.

Treatment. — The local measures are very important. The means which Oertel recommends, and which have the sanction of other high authorities, is the inhalation of vapor of hot-water; under this treatment the formation of pus is favored in the mucous membrane of the throat, which tends to form a line of demarcation against the further extension of the false membrane. A croup-kettle, or any other vessel which can be covered by a funnel, to conduct the steam to the mouth, is the proper means.* Common salt, or chlorate of potassium (fifteen grains to the ounce), may be added to the water. In severe cases, inhalations should be used every half-hour for ten or fifteen minutes, and gradually at lengthened intervals, as the diphtheritic inflammation subsides and membrane is cast off. For the purpose of limiting the danger of absorption of infecting material from the throat, a gargle of chlorine water, made as follows, may be used:

Chlorate of potassium	½ an ounce.
Muriatic acid	2 drachms.
Water	1 quart.

Put the first two into a strong quart bottle, and as the fumes which arise are given off, pour in the water. Keep the bottle corked.

Another gargle may be made thus:

Permanganate of potassium	24 to 48 grains.
Water	1 pint.

Or,

Oil of thyme	1 drachm.
Alcohol	½ pint.
Water	½ pint.

Of either of the above, one or two tablespoonfuls, repeated once or twice, may be used each time.

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* See, also, chapter on the Throat.

In very young children a swab or syringe may be used to clean the throat. Caustics and strong solutions of iron, and other astringents should by no means be applied to the throat.

When the larynx becomes involved, with obstruction to breathing, the case is urgent, and strong means require to be taken to remove the obstruction. The membrane may be detached, in some cases, by giving emetics. Syrup of ipecac, in teaspoonful doses given with warm water; alum, in teaspoonful doses dissolved in water, in cases of small children; or from one-half to one grain of tartrated antimony (tartar emetic) in case of older children or adults, in water, are useful. Efforts have been successfully made to remove the membrane from the opening into the air-passage (*glottis*) by means of suitable instruments. The vapor inhalations should also be used more energetically. When suffocation is imminent, an opening into the wind-pipe (*tracheotomy*) has been resorted to, but has been followed by death in nearly every clearly proven case of diphtheria. The most that can be said in favor of the operation is, that the terrible symptoms of suffocation are relieved, the patient meanwhile gradually dying by the less painful method of slow blood-poisoning from the open wound.

The general treatment must be directed to moderating the fever, for which quinia, in doses proportioned to the age of the patient, of two and a half to ten or fifteen grains, may be given. The quinia is also useful in sustaining the vital forces. When the general symptoms improve, constitutional treatment may be for a time suspended, carefully watching, meanwhile, the bodily temperature and the strength. If strength fails in the later stages, iron in the form of tincture of the chloride, in doses of three to fifteen drops, two to three times a day, according to the age of the patient, may be given in a couple of teaspoonfuls of glycerin and water. Under the same circumstances stimulants may be resorted to in proportion to the depression and the age of the patient. For small children, one part of brandy to two parts of syrup of orange-peel may be given in doses of a teaspoonful or more; or the stronger wines for older children and adults. The amount of stimulants a patient in a condition of approaching collapse will consume in the course of the day is astonishing. If the pulse were to sink and the bodily temperature rapidly decline, no benefit could be gained from either stimulant or tonic treatment. In cases in which prostration is marked, hypodermic injections of brandy are very valuable.

The treatment of the milder forms of paralysis is simple, as the tendency is toward a spontaneous cure. Iron and quinine, in quantities mentioned above, will prove useful in cases in which debility is present. Electrical treatment is to be resorted to with

caution, and never except under the advice of a physician skilled in its use.

The preventive treatment, spoken of so frequently in relation to other infectious diseases in this chapter, will apply with great force to this scourge of our modern civilization. If public hygiene could be brought to what yet exists as ideal perfection, there is no doubt that diphtheria could be stamped out.

Acute Eruptive (Exanthematic) Diseases.

Under this group is included a class of diseases which arise from a specific contagion, and are distinguished by peculiar appearances upon the skin. These are measles (*rubeola*), scarlet fever, (*scarlatina*), chicken-pox (*varicella*), small-pox (*variola*), and the artificial disease of vaccination (*vaccinia*). The latter is treated of hereafter.

Small-Pox.

Cause and Natural History.—We are able to say nothing about the cause of this disease further than that it is the result of a specific poison or contagion, from which no period of life is exempt. The disease spreads by means of a specific poison, "which is generated in the body of a small-pox patient and conveyed directly or indirectly to a predisposed person," and produces in him an attack of the disease. This poison is contained in the small-pox pustule or eruption, and also in the secretions of the body. The contagious stage of the disease is when the pustule contains matter in its earliest stage; it can be conveyed, however, before the eruption has appeared. An attack of the disease gives exemption from the disease for the remainder of life, as a rule.

Symptoms.—After exposure to the contagious poison, a period of ten to thirteen days passes; then occurs the first (*initial*) stage. This is ushered in by a chill, or by several chills, followed by fever, which lasts until the eruption appears. During the fever the head- and back-ache are intense; the latter, in epidemics of small-pox, is a symptom recognized as most characteristic by many people. The tongue is covered by a whitish-yellow coat; the breath has a peculiar "greasy" and offensive odor; the appetite is destroyed, and nausea and vomiting are not unusual. When the mind is disturbed, it usually is limited to talking strangely, more rarely there is delirium, while nearly all suffer from sleeplessness. Toward the end of the first stage the throat becomes red and swollen, while distinct red spots, which are not rarely noticed, are very important

in defining the disease even during this stage. In late years attention has been called to a rash, greatly like that of scarlet fever, which appears during the initial or commencing fever (and hence called the *initial rash*), and which is usually seen on the abdomen and inside of the thighs.

At the end of the third or on the beginning of the fourth day the eruption appears; first upon the face, scalp, nose, and upper lip. Its first appearance is that of slightly red spots, from a millet-seed to a pin-head in size, and is attended by burning and itching. A few hours later, small, red, shot-like points appear upon the back, breast, and arms, gradually invading the whole body. On the second day of the eruption (the fifth of the disease) these points have become dark red, enlarged and elevated (*papules*). On the third day of the eruption these elevated points become filled with a clear milky fluid (*vesicles*). These vesicles enlarge until the seventh or eighth day, when they become conical in form and about the size of a pea; and as this gradual enlargement takes place the point becomes depressed (*umbilicated*). On the eighth day, the eruption, which has been gradually growing cloudy and pearly, becomes thick and yellow; the vesicles are now filled with matter (*pustules*), and this defines the stage of suppuration. These points of suppuration sometimes merge one into the other, becoming what is termed *confluent*. This is the terrible stage of the disease, in which, from the swelling of the skin and underlying parts, the face is distorted beyond recognition.

Upon any point of the surface that has been scratched or irritated, the maturation occurs with greater intensity. At the same time the small-pox eruption appears upon the mucous membranes, especially of the mouth and throat, where it runs essentially the same course as that upon the general surface of the body.

As soon as the eruption appears, the initial fever, the pain in the head and back, and the nausea or vomiting, subside.

When the vesicles become filled with matter (*pustules*), fever again makes its appearance. This is called the "suppurative fever," and continues from three to eight days, attended with restlessness and want of sleep.

On the eleventh to the twelfth day the pustules begin to dry, forming, on the thirteenth or fourteenth day, hard, brown scabs, which are cast off by degrees, attended by intolerable itching, the general surface often appearing red and spotted.

A form of the disease called *varioloid* occurs in those who are partially protected by vaccination, or in those who have naturally a slight susceptibility to the small-pox contagion. In this form the initial fever is lighter: the eruption remains in the form of

vesicles, which do not become pustules ; and there is no suppurative or secondary fever.

When an attack of true small-pox terminates in death, the usual signs are dry tongue and delirium, with dysentery, diarrhœa, hemorrhage, pneumonia, or bronchitis, the two latter generally appearing in the course of the secondary fever. In the confluent form, death may occur in the suppurative stage from exhaustion.

Before Jenner's discovery of vaccination, deaths among children were fully one-tenth of the whole number of cases, and now, where compulsory vaccination is in force, the death-rate in infancy is only about two per hundred. The average mortality for all ages is from fifteen to twenty per cent., according to the severity of the epidemic influence.

Treatment.—In the initial stage we can do nothing but alleviate the general condition. The room should be kept at a temperature of 60° or 70° Fahr., and the patient should be kept cool (*popular prejudice to the contrary notwithstanding*), giving lemonade or Selters water, and milk with lime-water for food.

When the eruption appears, the treatment must be governed by circumstances. The best way to manage the eruption is to apply cold-water compresses, especially to the face and hands ; the swelling, redness, and pain, are thereby very much lessened. Pitting is not prevented by this means, or any others, such as applications of tincture of iodine, or mercurial ointment. The throat may be gargled with

Chlorate of potassium	2 drachms.
Water	1 pint.

Or,

Permanganate of potassium	30 grains,
Water	1 pint,

as already described in speaking of diphtheria, or with a tea made with one ounce of marsh-mallows steeped in a pint of boiling water and sweetened slightly.

The diet should be beef-tea, milk, milk and egg, broths, or porridge. In case of restlessness and delirium, hydrate of chloral, in ten or fifteen-grain doses, dissolved in well-sweetened water, may be given if the throat is not too sore ; if this cannot be given, the following may be substituted :

Bromide of potassium	5 to 10 grains.
Sulphate of morphia	$\frac{1}{6}$ grain.
Water	1 ounce.

If the patient shows signs of failing vitality, or of collapse, stimulants may be freely used. When the crusts begin to be cast off, warm bathing may be used with advantage.

Prevention.—Vaccination and *re-vaccination* as often as every five to eight years, and whenever there is an epidemic of the disease.

Chicken-Pox—Varicella.

Cause.—This disease has been supposed to hold peculiar relations to small-pox, which idea is now obsolete. The disease cannot be communicated by inoculation. It is doubtful if it is contagious, it certainly is not in the same sense as small-pox. One attack protects the system against a second, but not against small-pox, and the disease usually occurs in epidemics, mostly among children.

Symptoms.—Fever, without a previous chill, usually very light, sometimes scarcely noticeable, and lasting two days, is the initial symptom. On the second day the eruption appears, first as small red spots, which quickly form vesicles. The eruption usually appears in successive crops, for two or three days. The vesicles are clear and transparent, or slightly yellowish, and easily broken, and they maturate on the fourth or fifth day. They dry up and form small, brown crusts by the sixth day, leaving on the surface red but not depressed spots. Now and then, when a vesicle is scratched, a pit will form, but this is rare.

Treatment.—No special medication is required. At most, a dose of a teaspoonful of calcined magnesia and light diet for a day or two will meet all the demands.

Measles—Rubeola.

Cause.—This disease, like all others of its class, originates in a specific, contagious influence that is generated in the bodies of those affected with the disease, and is capable of infecting others either by personal contact or through the air. It prevails generally in epidemics.

Symptoms.—The early symptoms are headache, pain in the limbs, lassitude, and chilliness followed by fever. With the development of the fever (sometimes before it), are symptoms of catarrh of the nose and throat, red and watery eyes, huskiness of the voice, and a hard, dry, hoarse cough. Sometimes the fever is nearly absent, the catarrhal symptoms being all that are noticeable of this stage, but cases are not unfrequent in which the intensity of the early fever is extreme. During this stage very young and teething

children are sometimes attacked by convulsions. On the beginning, or toward the end of the fourth day, the rash appears in the form of fine, red, slightly elevated spots, which disappear on pressure. These appear first upon the face, neck, and chest, generally covering the lower limbs in forty-eight hours. The rash soon runs together in irregular, crescent-shaped clusters, with intervening spaces of very nearly healthy skin. The eruption feels rough to the finger, with now and then small elevated points, or small vesicles scattered over the surface, with itching and tingling on the third day of the eruption, which is the height of the disease.

The fever and catarrhal symptoms continue during the rash. On the eighth day of the disease (fourth of the eruption) the rash, fever, and catarrh decline together. The red color gives way to a dirty yellow tinge, ending in fine bran-like scabs, and is complete in four or five days.

There are many diversities in the time of appearance of the rash, in the rash itself, both in duration and extent and in the fever and catarrh. The disease is sometimes of a malignant character and quickly fatal. From the dark color of the eruption one variety is popularly called "black measles;" but this is fortunately rare.

Pneumonia and bronchitis are the most dangerous complications. Inflammation of the bowel, with diarrhœa and inflammation of the eyes and throat, are common; the latter, when occurring in a membranous form (like croup), is nearly always fatal. The danger is greater of a fatal ending to cases of measles occurring in old people and in young children, and in winter than in warm weather.

There is a slighter and shorter form known as *Rötheln*, or "German measles," and to which some writers give the name of *rubeola*, which term I have used as a synonym of measles.

Treatment.—Like all the specific eruptive diseases, the treatment mainly consists in relieving unfavorable symptoms as they occur. Light cases do not require any attention other than rest. The diet should be simple and nutritious. Cooling and effervescing drinks, with one to two-drop doses of tincture of aconite root at intervals of an hour, when the fever is high, will afford comfort to the patient.

If the catarrhal cough is troublesome, the following may give relief:

Muriate of ammonium	**30 grains.**
Sulphate of morphia	3 grains.
Powdered licorice-root	**1 drachm.**
Water	4 ounces.

Give a teaspoonful every four or five hours.

When signs of pneumonia present themselves, they should be attended to as if resulting from an ordinary attack of that disease. If symptoms occur which resemble croup or diphtheria, the treatment described in speaking of diphtheria should be resorted to.

Malignant measles should be treated like typhoid (low) conditions, elsewhere described in this chapter. [See page 32.] In case the eruption suddenly disappears, hot baths, or foot-baths of mustard and water, with mint teas, will tend to restore the rash. The same means may be employed if the rash is slow in appearing. The convulsions which sometimes attend the outset of the disease in early childhood are to be treated by hot baths, mustard poultices to the feet and limbs, cold applied to the head, and three to five-grain doses of bromide of potassium dissolved in an ounce of water and given every hour.

Diarrhœa (which is often present), when moderate, is not to be interfered with; but when violent, teaspoonful doses of chalk mixture every hour, in case of children, may be given; similar doses of paregoric in adults will answer the same indication.

Prevention.—The most efficient method of prevention is isolation of the patient. Attempts have been made to modify the disease by inoculation. The result is said to be favorable, but the measure has never become popular.

Scarlet Fever—Scarlatina.

Cause.—A disease having its origin in an acute specific contagion or virus conveyed from a patient to an unaffected individual. We can say nothing more than this without invading the field of speculative epidemiology, than which nothing can be more unsatisfactory to the popular reader.

Symptoms.—The period which elapses between exposure to the disease and its outbreak averages from four to seven days. With or without any preliminary chills, languor, or pains in the back and head, the fever sets in with flushed face, furred tongue, loss of appetite, nausea, or vomiting.* The intensity of the fever may be of all possible grades. Sometimes in advance of the fever, and at other times just after its onset, inflammation of the throat, with swelling and intense redness, presents itself. The tongue

[* In many cases this is one of the first symptoms which a parent will observe, while, in a small number of instances and in young children, a convulsion is the first to attract attention.—Ed.]

exhibits red points (*papillæ*) upon its surface, with red edges and tip.*

On the second day, usually, of the fever, the rash makes its appearance; first upon the neck and breast, whence it gradually extends over the whole body. At first it is in minute red spots or points, which rapidly run together in large patches, and in the course of a few hours form a continuous scarlet rash over the body. Sometimes the skin appears swollen, or small vesicles and minute prominences are scattered through the general eruption. The rash, however, offers many exceptions to the above.

The fever is continuous through the whole course of the eruption. The disease is at its height from the fifth to the ninth day, when the rash fades, the fever abates, and is quickly followed by scaling off of the cuticle (*desquamation*), which process is often attended by itching and irritation of the surface. A few days after the beginning of desquamation, albumen may be detected in the urine in nearly all cases of scarlet fever.

Simple forms of scarlet fever occur in which the throat symptoms are wanting (*scarlatina simplex*), and such cases are usually mild.

Another and very serious form is that in which the throat symptoms are the most prominent event (*scarlatina anginosa*). The eruption is usually later in making its appearance, and, as a rule, is less copious. Patches of what resembles false membrane appear early upon the tonsils. The breath has an offensive odor. The glands under the jaw and at its angle are swollen and painful. Swallowing is painful and difficult. A thick mucous is secreted in the throat, which clings to the surface and is difficult to swallow or cough up. The inflammation often extends up the nose, which discharges an offensive and irritating mucous. The coating upon the tongue disappears early in the attack, and the tongue itself becomes dark red and smooth, or with projecting points (*papillæ*). As the disease abates the incrustations of false membrane upon the tonsils gradually disappear, leaving the surface red and sometimes ulcerated. Recovery is slower in this form, and secondary diseases are more liable to be developed. Suppuration of the glands of the neck and general blood-poisoning are not rare results.

The disease is now and then malignant in its form (*scarlatina maligna*, malignant sore throat). This phase of the disease is very fatal—often even in its first stage.

[* These red points are often sharply defined in the midst of a whitish or yellowish coating of the tongue, and give it an appearance similar to the seeds of a strawberry; hence this condition is commonly known as a "strawberry tongue." This is not, however, strictly characteristic, as is popularly supposed, for it is seen in other diseases.—ED.]

A long train of evils (*sequelæ*) often follow scarlet fever. Suppurative disease of the throat, ears, and neck; troublesome and even dangerous diarrhœa; inflammation of serous membranes, as of the brain (*meningitis*), of the chest (*pleurisy*), or of the bowels (*peritonitis*); inflammation of the joints, resembling rheumatism; and, most serious of all, dropsy, are among the more common after-effects. The dropsy is due to disease of the kidneys, and is attended by scanty urine containing albumen.*

The results in a case of scarlet fever are always uncertain. Not only are its immediate results highly dangerous, but the after effects as well. The grade of the disease in each epidemic has an important bearing upon the expectation of results (*prognosis*). Female patients bear the disease better than males, but it is very dangerous in pregnant and lying-in women. The greatest mortality occurs in children under ten years of age. The mortality of the first year of life is estimated by Fleischmann at 75 per cent.; from the second to the fourth year at 43 per cent.; from the fifth to the twelfth year at 19 per cent.; and from the thirteenth to the twentieth year 5 per cent. Others place the aggregate mortality at 5 per cent.

Treatment.—A disease, the course of which cannot be cut short or interrupted, tends naturally toward recovery. The proper course, therefore, is to be prepared to attend to each symptom as it becomes more or less urgent, and not to make attempts at curative treatment. The simple form of the disease, or that in which no urgent throat symptoms present themselves, is to be treated by rest in bed in a room having a temperature of about 60° Fahr., until the peeling off of the outer skin is completed, with full or sponge baths daily at the temperature of 65° to 95° Fahr. Simple gargles of chlorate of potash or muriate of ammonia are useful. [See formulas below.] If the stomach is irritable for a day or so, food should be given sparingly; milk and broths may, however, be used. Other than this it may not be necessary to give medicine at all.

If the fever is very high, use cold baths. Old-time prejudice must give way before the fact that a cold bath in the high temperature of scarlet fever is never harmful and always useful. Blood-poisoning may in a measure be counteracted or retarded by quinine in doses of three to fifteen or twenty grains, according to age; or, as Thomas recommends, the sulphocarbolate of sodium to the extent of fifteen to sixty grains daily, in doses of three to nine grains each, dissolved in water. Collapse is to be treated by free use of brandy, or car-

* [This result is said to be most common in cases where the amount of rash on the skin has been least.—ED.]

bonate of ammonia, in three to ten grain doses in solution in water, and given frequently. In case of retarded eruption, use mustard poultices, friction of the surface, or a warm bath, if not contraindicated by excessively high temperature. Anointing the skin with lard, cosmoline, the rind of bacon or ham, or with a lump of cocoa-butter, will sometimes favor the eruption, and will always tend to relieve the itching and tingling of the skin.

For ordinary throat symptoms nothing need be done further than has already been mentioned. [See below.] In very young children it is impossible to do anything locally, on account of the excitement of the patient caused by any attempt to make applications to the throat. Cold fomentations to the swollen glands of the neck, slight incisions with a knife, in case of adults, and pencilling with a solution of nitrate of silver in children, when the tonsils threaten suffocation by enlargement, may do some good; but these measures must, of course, be left to a physician.

DISINFECTING GARGLES.

Chlorate of potassium ..... 2 drachms.
Water ..... 1 pint.

Or,

Permanganate of potassium ..... 1 drachm.
Water ..... 1 pint.

Or,

Chlorate of potassium ..... ½ an ounce.
Muriatic acid ..... 2 drachms.

Put the two substances into a strong bottle, and, while the fumes which arise are escaping, add a quart of water and cork the bottle.

Or,

Carbolic acid (pure) ..... 1 drachm.
Hot water ..... 1½ pints.

Let it cool and use as a gargle.

During convalescence, nourishing diet, tonics, and preparations of iron will assist nature in rousing the exhausted vitality.

The various complications that attend a case of scarlet fever are to be treated like independent affections, such as are described in other portions of this volume.

Great importance must be given to prevention (*prophylaxis*). This is best accomplished by removing the well from the sick, or by rigid seclusion of the latter in a remote part of the house, to which only the attendant is admitted. Carpets, window drapery, and all unnecessary furniture of every kind must be removed from the room. Ventilation should be constant, but no draughts should blow directly over the patient, though this may not be particularly

feared. Expectoration, urine, and discharges from the bowel should be received in vessels in which carbolic acid solution or chloride of lime is contained. The patient's linen should be changed often, and at once put, before boiling, in carbolic acid solution made by adding an ounce of pure carbolic acid to a bucket of hot water. Instead of handkerchiefs, which are in great demand about a patient, inexpensive pieces of cotton cloth, or soft old muslin, should be used and burned directly afterward. The attendants should be religiously neat in their persons, frequently washing the hands in disinfecting fluid (such as the carbolic acid solution mentioned above), as well as disinfecting their clothes before coming in contact with well persons. For articles of clothing that cannot be washed, the best way to disinfect is to expose them to the heat of an oven and then airing and beating them. The fine scales that are cast off from the skin during the peeling of the outer skin are supposed to be highly infectious, and great care must be taken to prevent them flying about the house or room. Covering the body with olive oil and then carefully bathing the patient is a good plan. The patient ought not to be allowed to mingle with the family until the scaling off of the skin is completed. The room should then be disinfected with burning sulphur upon a hot shovel,* newly painted, papered, or whitewashed, and kept open to the air for some time before it is used again by the family.

The invariable rule should be to guard young children under ten years of age, by *all possible means*, from scarlet fever infection.

Table of the Distinguishing Signs of the Eruptive Diseases.

It is sometimes not an easy task to distinguish one eruptive disease from another. It is believed that the following table, condensed from Dr. Da Costa's graphic description of these diseases, will prove useful to the general reader:

DIFFERENCES BETWEEN SCARLET FEVER, MEASLES, AND SMALL-POX.

Scarlet Fever.	*Measles.*	*Small-pox.*
Period of attack after exposure: from a day to two weeks.	Period of attack after exposure: seven to fourteen days.	Period of attack after exposure: six to twenty days.
Fever with great heat of skin, very high pulse, persists through eruption.	Fever moderate, heat of skin and pulse rather increased by eruption.	Fever very high, with bounding pulse, great pain in loins, and relief on appearance of eruption.

* [See, also, section on **Cholera**, page 92.]

Scarlet Fever.	*Measles.*	*Small-pox.*
Eruption on second day, first on neck and chest; spreads rapidly.	Eruption on fourth day, first on face; spreads slowly in about forty-eight hours over the rest of the body.	Eruption at end of third or beginning of fourth day; first on lips and forehead.
Eruption uniform, or in large patches, scarlet line interspersed with raised spots and some small vesicles, seventh day from its appearance, followed by very complete desquamation (scaling).	Eruption in crescent-shaped patches, between which is healthy skin; lasts five days, followed by incomplete peeling of the surface of the skin in very fine scales.	Eruption first papular for first day, then becomes vesicular, then pustular; on eighth day pustules maturate. (See description of eruption in section on Small Pox.)
Sore throat, rarely catarrh of the nose or cough.	Nasal catarrh and catarrhal cough very constant; rarely sore throat; bronchitis.	Often sore throat and dry cough; bronchitis only as a complication.
Red "raspberry tongue."	Tongue coated, may be red at edges; does not lose its coat.	Tongue coated, swollen; may be red at edges.
Brain-symptoms frequent and grave.	Brain-symptoms rare; not severe.	Brain-symptoms frequent.
No secondary fever.	No secondary fever.	Always secondary fever.
After effects: kidney disease, dropsy, inflammation of the eyes, discharge of matter from the ears, deafness, chronic diarrhœa, enlargement of lymphatic glands.	After effects: chronic bronchitis, inflammation of eyes.	After effects: chronic diarrhœa, enlargements of lymphatic glands, various diseases of eyeballs and eyelids.

ELY VAN DE WARKER, M.D.

Epidemic Cholera.

The offspring of vice, penury, and superstition, vitalized by the intense heat of the tropical sun acting upon masses of organic matter, the result of luxuriant vegetation and the nastiness of human animals, *epidemic cholera* was born in the Delta of the Ganges. Nourished by the filth-sodden earth and polluted atmosphere; aggravated by the requirements of an intolerant priestcraft; pandered to by the brutal sensuality of Oriental life; sustained by victims from the constantly arriving hordes of devotees, the disease spread from the place of its birth and early secured recognition from the world.

The necessities as well as the superstitions and views of mankind extended the area of cholera power. The annual religious and commercial gatherings of the Asiatics became centres from which the disease was diffused among all Oriental nations. Ar-

mies and caravans upon the land, boats and rafts upon the rivers, merchantmen and war-vessels upon the high seas, were the active agents; while the passive, but no less powerful agent was the total disregard of sanitary laws evinced by all nations of the East. As years passed, all the great lines of travel were marked by the disease. Ascending the Ganges to the mountains of the Punjaub, it was carried into Afghanistan, Persia, and Turkey in Asia, coming out upon the Black and Caspian Seas, and thus advancing on Europe. Descending the east coast of Hindostan, the Presidency of Madras was infected. Crossing the almost unknown interior of the Empire, the Presidency of Bombay was added to the endemic area, and the populous cities of Madras on the east and Bombay on the west coast of the peninsula became centres for the export of the pestilence. Descending the Indus, a third maritime focus was established at the city of Kurrachee.

Arabia received the disease from Hindostan, fostered it by the vast concourse of devotees who assemble yearly at her holy cities, and in turn delivered it to the inhabitants of the Mediterranean coast and of the continent of Africa.

Cholera having overrun the old world, it was in order that the new should be conquered. In 1832 the disease crossed the Atlantic Ocean. This transit was the result of no mysterious agency of sun, air, or water. Those natural forces had no part in the diffusion other than that they facilitated the descent of a vast army of emigrants upon the shores of North America who brought with them their personal effects and cholera. Since 1832, whenever Europe has been visited by cholera, the lines of epidemic diffusion have reached the American continents.

While it is true that there are other acute infectious diseases which have occasioned, in the aggregate, as many deaths, and which are as insidious in their approaches, still there is that about epidemic cholera which makes its name a terror. The suddenness with which the blow descends, the wonderful transformation which takes place in the patient, the rapidity with which the disease runs its course, and its capriciousness in the selection of its victims, surrounds it with a deeper gloom and a greater appearance of mystery than any other known disease.

There is, however, nothing mysterious about cholera. We are able to account for its occurrence with far greater certainty than we can account for the spread of some other infectious diseases. We are able to arrest the disease, to stamp it out, and the spread of sanitary knowledge will soon render it impossible for an epidemic of cholera to gain power upon American soil.

Causes.—*Epidemic Cholera* is a specific disease of the stomach

and intestine, which arises from a special cause and not from any combination of causes. It is an acute infectious disease, but it is not infectious in the same way in which small-pox, scarlet fever, or diphtheria, are infectious. It cannot be induced by inoculation. It is not induced by contact with a patient suffering from the disease; but it is caused when the specific poison gains access to the alimentary canal of a predisposed individual. [One whose condition of body disposes it to the action of disease under the application of an exciting cause.]

This specific poison of cholera is a product of decomposition which takes place in all the discharges which occur from the person of an individual suffering from the disease in any of its stages. This decomposition is hastened or retarded by the same laws which govern the process in all organic matter; but, in the decomposition of "cholera stuff" (the term which will be applied to all cholera discharges), there is a defined period in which this specific poison is developed, and during which it manifests its virulent power. *Before that period has been reached, there is no poison; after that period is past, there is no poison.* It is, therefore, evident, that if the decomposition of "cholera stuff" be prevented, the development of the poison is also prevented.

This stage of virulent activity is limited to the period when, by the aid of a microscope, small moving bodies, which are known as vibriones, may be seen moving through a drop of the liquid. Therefore we can but reason that whatever will hasten the process of decomposition in this "stuff," hastens the development of the specific poison, and contrariwise. It is not thought that these vibriones can, of themselves, produce cholera, but it is known that they indicate, by their presence, the fact that the molecular matter has reached that degree of development which constitutes the cholera poison.

We know, it is true, but little about this specific poison of cholera, but we do know that the disease can be acquired only by the contact we have described, and that there are three factors which must be combined before the disease can be developed. These factors are: 1. *The specific poison of cholera.* 2. *The taking of it into the body by the digestive passages, or the ingestion of the specific poison.* 3. *A predisposition on the part of the recipient of the poison.* When these three factors are present, then the disease will occur, but it is essential that they be equally positive.

When the specific poison of cholera has been swallowed and comes in contact with healthy gastric juice, the latter, by virtue of its acidity, utterly destroys the poison. If, however, the gastric

juice has not its normal acid reaction, then the specific poison meeting only alkaline fluids, is able to reproduce itself—that is, from the cells which were originally swallowed a vast number of similar cells are formed. These cells possess the peculiar power of fastening themselves upon, and of destroying, by their contact, the little epithelial cells which cover the mucous membrane lining the digestive apparatus, as it also lines all other cavities or surfaces of the body. Vast patches of the intestinal epithelium are stripped off, exposing the delicate blood-vessels, which pass in folds and loops in every direction. From these uncovered vessels all that portion of the blood which is fluid enough to find its way through the remaining walls, flows out and is collected within the intestinal cavity, and as millions of these vessels are uncovered, there is nothing surprising in the fact that a fatal loss of water may occur in a very short time. It is to this rapid and absolute abstraction of water from the system that all the symptoms of the disease are due.

In its cause, and in all that which results from that cause, cholera differs from every other known disease, although upon its border-lands are to be found diseases which present shades of resemblance which have induced some to consider them all as from a common stock, but it is a grave error. Cholera is simply —cholera. Every case of cholera has its origin in some preceding case of cholera. An epidemic of the disease occurring in British India, reaches out its arms and embraces all nations of the world, and the earliest and latest victims of that epidemic outbreak are as surely united in the chain of disease-influence as if they were dwellers in the same house, and not separated by thousands of miles.

Symptoms.—An attack of cholera is generally preceded by a slight, painless diarrhœa, one which may be characterized as a "looseness of the bowels." The patient has a sense of discomfort in his abdomen, a rumbling of the bowels, and an occasional desire for an "action." A sensation of sickness, or indisposition [*malaise*] attends this stage, which may last from one to five days, attracting greater or less attention according to the character of the patient. The diarrhœa is attended with gradually increasing fatigue or lassitude, and inability to undergo any muscular exertion. It is in this stage of the disease that the specific poison is being reproduced within the patient's body, and it is of vital importance that in cholera times such symptoms should not be disregarded, as at this time the progress of the disease may be arrested.

In the majority of cases the infected person retires to his bed

at night without greater symptoms of impending danger than upon any previous night; but during the early hours of the new day he is awakened by an active desire to go to stool, which is usually so urgent that a night-vessel or the first convenience at hand must be used. Relieved from the desire which but a moment before was so active, he returns to his bed and falls asleep. Let us examine the contents of the vessel. We find it nearly full of a clear liquid, which looks like water. It has a sweetish, sickening smell, like to that which comes from the carcass of a freshly-killed animal. If we take a little upon our fingers, we will find it to be slightly sticky or glutinous, and if we reflect the rays of light into the vessel we will see numerous small transparent bodies floating about and gradually settling on the bottom. *It is the characteristic rice-water discharge of cholera.*

While we have been thus engaged, the patient again becomes restless. He springs from his bed in the rush to relieve himself, and returns pale and complaining of a sensation of prostration, and with a slight nausea. In a few moments the desire returns, and is as uncontrollable as at first. The prostration becomes marked. The nausea gives place to vomiting, and cramping of the extremities follows. As the case advances, the patient is no longer able to leave his bed, which is soon deluged with the discharges. The surface of the body is cold to the touch, but complaints are made of intense heat. The skin on the fingers and toes becomes shrivelled like that upon the hands of a washerwoman, and livid in color. Water is constantly demanded, but it is no sooner drank than it is vomited. The voice loses its volume and expression and becomes husky, low, and unnatural. The features become pinched, and denote intense anxiety. The eyes are unnaturally bright. A profuse perspiration bathes the surface of the body. The pulse becomes threadlike and then disappears. The exhibition of restlessness is fearful to behold. It requires intense effort to breathe. Moments have the weight of years, and the patient who, but a few hours past, was a strong, vigorous man, a delicately beautiful woman, or a charming child, is transformed into a helpless, moaning, mumbling octogenarian.

A general deepening of all the symptoms occurs, and the patient is in collapse. The crampings which seemed to have subsided may return, and when they return, the last agony of the patient is worse than the first. Death may quickly close the agony, or it may be that after hovering between life and death for hours, the severity of the symptoms may subside, but the patient is left shattered by the violence of the storm to face the dangers of a slow and tedious convalescence.

This is the outline of an ordinary attack of epidemic cholera. The case is not, however, always as mild as that which has been described. Occasional cases are seen in which the patient passes almost instantly into profound collapse. The various stages of the disease either do not exist, or they are so intimately blended and occur so rapidly that there is nothing to mark where one stage ends and another begins. Fortunately such cases are very rare.

Mode of Propagation.—Cholera is diffused in various ways, but the medium most frequently selected is water. In Eastern countries, where little or no care is taken to maintain a supply of pure drinking-water, the disease is almost invariably diffused through its agency, and it has been found, by those who have carefully studied the histories of many cholera epidemics, that in the majority the cause is found to have been polluted water. Leakage from sewers and drains often infect wells, cisterns, or other receptacles of water, and the use of such water induces the disease whose specific poison was mixed with the contents of the sewer or drain. Cholera is a striking illustration of the fact that when wells or cisterns, or the basins of springs are so badly protected that rain water, flowing over the surface of the ground has free access to them, they may become infected with the cholera or other specific poison.

To a modified extent cholera may be diffused through the medium of the atmosphere. The "cholera-stuff" having been deposited in an impure privy, an active and virulent development of the poison takes place, and all who enter the privy are liable to the infection. How? Individuals do not eat or drink the contents of privies, and if cholera is a disease of the digestive organs, how could it be acquired from such a locality? The gases which arise from the fetid pit carry upward with them the specific poison, which is inhaled, and becoming entangled in the saliva, it is swallowed. Indeed it is by no means certain that an individual sitting at stool over a cholera-infected privy may not receive the specific poison upon the exposed mucous surface of his rectum, and that in this way his intestinal epithelium may be infected as effectually as if the poison had been swallowed. The atmosphere of a room which has remained closed and without cleaning or ventilation after the termination of a case of cholera, may induce the disease in individuals who use the apartment at a later date. The atmosphere about the mouths of sewers and drains may become infected from the discharge of such vents, although the point at which the "cholera-stuff" was emptied into the drain may have been at a long distance from the point at which the final discharge occurred. Exhalations from soil which has been polluted by leakage from broken or defective sewers or drains, may charge the sur-

rounding atmosphere with the cholera poison. Exhalations from cesspools, garbage heaps, or from any masses of decomposing matter, will contain the cholera poison, provided "cholera stuff" has been added to the original mass.

In any of these ways the atmosphere may be charged with the cholera poison, but the power of the atmosphere in diffusing the infection is confined to a limited space. An individual seated or standing in such a privy, or working in the fetid drains or at their mouths, or laboring on infected soil, or living over infected ground, cesspools, or garbage heaps, is exposed to the infection. Those who reside within a few yards of such places may be exposed to the infection, provided that the direction of the prevailing winds are toward such habitations; but the morbid influence can be exerted to no greater distance, for the poison is rapidly oxydized and its power destroyed.

The poison of cholera may be diffused by food which may become polluted in various ways. Cooks and bakers who are suffering from the premonitory diarrhœa, or from the disease in its more aggravated form, have been known to continue at their work with hands and clothing soiled with the discharges. Such persons, in handling articles of food, could not fail to pollute the articles. Broken or defective drains not infrequently discharge into cellars in which vegetables are stored. Meat may become polluted in cholera-infected slaughter-houses. Milk may be polluted from dilution with infected water, or from the pans in which it has been stored having been washed in such water. Vegetables or fruit may be polluted through the media of winged insects, who, having fed upon exposed discharges from the patient, alight upon the object with portions of the "cholera-stuff" still adhering to their bodies.

Cholera may be diffused by fabrics which have been soiled with cholera discharges, and upon which the discharges have dried. Articles of all kinds, clothing, bedding, carpets, curtains, towels, chairs, tables, bedsteads, chamber-vessels, cups and saucers, tumblers, spoons, plates, and dishes, may be, and often are the media by which the disease is diffused. In such instances the "cholera stuff" drying upon the article, no decomposition has occurred; when the article is handled, the dry "cholera stuff," disturbed by motion, breaks off, and atoms float in the air which, when inspired, may occasion the disease. *If these things be true, why is it that greater numbers of individuals are not attacked in every epidemic?*

As yet, no pandemic (that is, an epidemic which attacks the whole of a population) of cholera has been known in the world.

Should epidemic cholera ever assume so malignant a type that the third factor which we have given as an essential for a cholera outbreak has no longer existence ; or, in other words, should the poison of cholera ever become so powerful that every individual to whom it gains access will become a subject of the disease, no matter how powerful may be his digestive organs, then this world will surely be depopulated.

Two individuals may drink an equal amount of cholera-infected water, one in high health, the other suffering from some temporary derangement of the digestive organs. When the poison reaches the stomach of the first individual it is at once acted upon by the normal gastric juice, the acidity of which promptly destroys the poison. It is cast out of the body with other débris, and the individual is unconscious of the contact. In the second instance, the poison reaches the stomach at a time when the gastric juice is not normally acid. The poison immediately assumes its power of aggressive development, and passing into the intestinal canal, meeting only alkaline fluids, the development is rapid and an explosion occurs. During an epidemic of cholera, it is particularly those whose systems are vitiated by other diseases ; those suffering from depression of the nervous forces from any cause, but especially that which attends excessive fatigue, fear, or sensuality ; those who live in open violation of all hygienic laws ; those who are impoverished by want or disease, who are liable to its attacks.

Cholera exists only where it has been carried. The disease can be developed only when the molecular matter contained in the discharges from a case of cholera are deposited in a locality favorable for its rapid decomposition, which is, in this case, not a process of destruction, but of new development, and a fresh explosion of cholera can only occur when a portion of the specific poison has gained access to the digestive apparatus of a predisposed individual. It is a law of nature, that organic matter undergoes decomposition more rapidly when it is added to other organic matter in which the process has already occurred, and while it is true that this cholera development takes place when the " cholera stuff " is placed upon the surface of the earth in a favorable locality, so is it also true that the same development occurs when the poison is added to decomposing organic matter within the human intestines. Is it not true that numerous human whitened sepulchres exist ? Those who clean the external surfaces of their bodies with care, but who deliver their internal surfaces over to uncleanness. During days of epidemic sway such individuals are food for the disease.

Prevention.—The best way to treat cholera is to prevent its occurrence. The surest way to prevent epidemics of the disease is to maintain all communities in good sanitary condition. No magazines of decomposing organic matter should be permitted to exist, as but a minute spark of cholera poison is sufficient to cause an explosion. It is no time to institute sanitary precautions when an epidemic is on a community. The terror which the disease inspires renders it impracticable. That which has not been effectually accomplished before the outbreak of the epidemic must remain undone.

While the requirements of health demand that constant cleanliness of habitations be maintained, in times of cholera the necessity is more imperative. Dwelling houses, from garrets to cellars, should be kept scrupulously clean; débris of all kinds must be removed, and perfect ventilation must be secured. The exhalations from the ground upon which the house is built should never be permitted to pervade the house. No portion of the house should be ventilated at the expense of the remaining portions. Apartments occupied as water-closets, bath-rooms, or wash-houses, should be isolated, and the ventilation of all rooms which have sewer-connections should be a matter of constant care. The house-drains should be kept in perfect order, and all discharge-pipes should be flushed each day, and at least once each week be treated with a solution of some active disinfecting agent. Privy-vaults and cesspools should be kept empty and clean by frequent disinfection. In rural communities the practice of defecating on the surface of the ground should be warmly condemned.

The water-supply should be an unceasing source of solicitude. In city houses care should be taken at short intervals to test the imperviousness of service pipes, and water should be filtered before being used for drinking purposes. Wells and cisterns and the basins of springs should be kept free from all organic impurities. The walls of wells and cisterns should be carefully examined for leaks from contaminating sources, and the direction and source of underground streams should be determined, that it may be known whether or not they have been subjected to pollution from fæcal or other organic matter. If such source of pollution be found, the use of the water must be abandoned. Stables, cow-houses, chicken-houses, pig-pens and their surroundings should be kept as clean as practicable. Fire, as a destructive disinfectant, should be employed upon all decomposing organic matter for which no profitable use can be had.

This outline embraces facts with which every well-regulated

family should be conversant, and the laws upon which they are founded should be observed at all times; but there remains for consideration certain precautions which individuals should adopt during cholera times, in order that they may hold an immunity from the disease. We shall consider them under the heads of personal cleanliness, dress, and diet.

Personal cleanliness, which is necessary at all times, becomes doubly so during a cholera epidemic. Scrupulous care of the person secures the removal of that which may, and often does prove to be the nucleus of disease. In the sultry weather in which we are usually called upon to meet epidemics of cholera, daily baths are among the most important adjuvants of health. In the early morning they invigorate to meet the fatigues of the day, and at night they encourage refreshing and strengthening sleep. Personal cleanliness is not confined to the external surfaces of the body; it is quite as necessary that the inner surfaces should be subjected to a daily cleansing. As cleanliness of the external surfaces can only be secured by the use of water, so is it with the internal surfaces. A glass of pure cold water drank immediately upon leaving the bed in the morning, and a visit to the closet after breakfast, not made in haste but with deliberation, will, in the majority of instances, prove effectual. Should it, however, fail, a small portion of table salt added to the draught of water, and the employment of an enema of water will induce the desired result.

The surface of the body should be fully and warmly protected, both by day and by night. Under-garments which have become saturated with perspiration should be removed, the surface of the body briskly rubbed, and dry articles substituted. Whatever may suddenly check perspiration should be avoided. A broad flannel bandage worn over the abdomen and around the person will impart a sense of comfort. Clothing which has been worn during the day should never be exposed in sleeping apartments during the night, and they should always be well aired before being again taken into use.

While it is advisable to be careful as to diet and rigidly to avoid all articles of food that experience has proven to be indigestible, it is as necessary not to produce any sudden or radical change. The digestive organs should be encouraged to the performance of their duty by the presence of well-prepared food. The use of the various condiments is to be encouraged. It is well, during an epidemic, for persons to indulge their appetites in their own houses, and from kitchens over which they may exercise full control. Vegetables and fruit, before they are eaten or prepared for the table, should be carefully washed in pure water. Such articles of

diet, either ripe or unripe, never of themselves caused a case of cholera since the disease was created ; but they may, when immature, occasion disturbances of the stomach, which experience has proven to favor the development of the disease.

The source of the water-supply of a family should be a matter of the greatest solicitude, and when a constant supply of pure water has been obtained, none other should be used. It is far better to suffer the pangs of thirst for a time, than it is to drink water from any unknown source. If none other can be obtained, pure ice can usually be purchased, and from it drinking water may be obtained. Suspected water must always be actively boiled and filtered before it is used for any domestic purpose. During a cholera epidemic it is advisable that each person should take into his stomach a certain amount of acid drink each day. Lemon or lime-juice may be freely used ; the mineral acids only when advised.

Whenever it is practicable, the soiled clothing of a family during an epidemic should be washed only upon the premises. Innumerable instances are known in which the diffusion of the disease has been traced to infected localities in which clothing was washed.

Can a case of cholera be so managed, that there will exist no danger of the disease being communicated to others ?

Most assuredly, yes ! No fear of personal danger need blanch cheeks when a cholera victim is in a house, provided a few simple precautions are adopted. Believe, truly and sincerely, that cholera is an acute infectious disease, resort to those measures which science has placed within your grasp, and you are perfectly secure in ministering to all the wants of the sufferer during his hours of anguish and pain.

It has already been stated that cholera is diffused through the discharges from the bowels of individuals infected with the disease in any of its stages. I fully believe that the discharges of the stage of premonitory painless diarrhœa, when the specific poison has but just begun its work in the intestines, are far more virulent in diffusing the disease than are those of the later stages when the rush of water has swept the intestines clean. When cholera is known to be in the country, every case of diarrhœa should be looked upon with suspicion, and it should be treated as if it were known that the poison had gained access to the patient. The individual should submit himself to absolute rest, and place himself in the hands of his medical adviser, and every point at which he has defecated should be actively disinfected.

The house in which a case of cholera develops, should immediately, but without confusion, be set in order. The objects to be

secured are three-fold. *To secure the comfort of the patient and the convenience of rendering him assistance. The disinfection of all the excreta* [perspiration, urine, fæces], *and of all articles which may have been soiled by them. The final disposition of the disinfected excreta.*

All superfluous articles of furniture should be removed from the room. The windows should be so arranged that perfect ventilation may be secured. The bedstead should be drawn out into the room, so that access may be had to it from all sides. The mattress should be covered with an oiled or other impervious cloth, upon which a blanket or soft quilt is folded. There will be required for use about the patient a plentiful supply of towels and some soft cloths ; also pitchers, tumblers, and spoons, from which medicines, drink or nourishment may be administered ; also several chamber-vessels. These articles, when once taken into use, should not be mixed with those in use by other members of the household.

To render the excreta powerless, that is, to prevent the development of the specific poison, it is necessary that the alkalinity of the discharges should be destroyed ; so long as they remain alkaline there is danger of decomposition, and when decomposition occurs the specific poison is developed. It is necessary to render these fluids acid, and when a strong mineral acid is employed in sufficient quantities, the minute particles of matter are destroyed.

Until a proper disinfectant can be obtained, vinegar should be largely added to each evacuation and vomit, but as soon as possible the following solutions should be prepared : 1. In a large bucket (one which will contain three or four gallons) five pounds of copperas should be placed, and the bucket be nearly filled with water, when three ounces of strong sulphuric acid should be added, and the mass mixed with a stick. A portion of this solution should be mixed with each lot of "cholera stuff," which is to be disposed of, in the proportion of at least one-fourth of the bulk. As the disinfecting fluid becomes exhausted, the supply must be renewed, and a full quantity must always be on hand and ready for use. This disinfecting solution must be kept at the point at which the "cholera stuff" is to be disposed of, where a small tub, filled with an acid solution (sulphuric acid one ounce, to water one gallon), should be in readiness, that all vessels, after having been emptied of their cholera contents, may be immersed therein.

In close proximity to the sick room should be a large tub half full of the acid solution (sulphuric acid one ounce, to water one gallon), into which all clothing and other fabrics taken from the

person or bed of the patient, or which have been soiled by the discharges, should be placed.

In the sick room, a quantity of water acidulated with the sulphuric acid, in the strength of one-half ounce of the acid to the gallon of water, should be prepared, in which the hands of attendants and the body of the patient may be frequently bathed. With this solution, the carpets, floor, or clothing of attendants should be cleaned, should they become soiled.

As long as possible, the cholera discharges should be received in porcelain vessels:—the discharges in chamber-vessels or bed-pans, the vomit in basins—and each time that the vessel is used it should be immediately carried from the room and treated with the copperas solution. When the discharges pass involuntarily, they should be received upon old cloths which, when saturated, should be removed from the bed and thrown into the disinfecting tub. The limbs and person of the patient should be frequently bathed in the acidulated water, which will be found to impart a greater sensation of relief to the patient than all the stimulating frictions which can be used.

The final disposition of the "cholera stuff" must be governed by the locality in which the patient resides. In cities, the excreta, after having been disinfected, must of necessity be cast into soil-pipes which enter into the general system of sewers, and if the primary process of disinfection has been effectually performed, and the pipe which is to be used has been treated plentifully with the copperas solution, it will be, probably, as safe a disposition as can be made of them. The process is as follows: Douche the drain-pipe with several gallons of the disinfectant. When a vessel is to be emptied see that, by stirring, the "cholera-stuff" and the copperas solution are intimately mixed. Empty the vessel so carefully as to avoid smearing the sides of the drain. Wash the vessel in pure water, which must be emptied into the drain. Immerse the vessel in the sulphuric-acid solution, allow it to dry, and it is ready for use. It is obvious that all this can only be accomplished when its execution is in the hands of an intelligent person, who should be called upon to perform no other duties.

In rural districts, the excreta must be disposed of beneath the surface of the ground. A pit should be dug, into firm earth preferably or that which has not been disturbed for a length of time, and in such position that drainage from it will not affect any supply of water. A quantity of copperas should be placed upon the bottom of this pit, so as to cover it completely for several inches in depth, and upon it a layer of fresh earth should be placed. Into this pit the "cholera-stuff," treated as has already been described,

should be thrown, and each deposit should be covered with fresh earth. When the pit has been filled to within a foot of the surface, it should be covered in, and a new pit in its immediate vicinity prepared. Into these pits all water used in cleaning vessels must be thrown.

Should the case terminate fatally, all articles of clothing should be immediately removed from the person and bed of the patient and placed in the tub containing the acid solution. If the mattress be soiled it should be saturated thoroughly with the acid solution, or, what is still better, it should be burned. A blanket or a shirt may be thoroughly and completely disinfected, but common sense would indicate that to obtain the same result with a mattress would be almost impossible. The body of the victim should be carefully washed in the acid solution, and while this work is being performed, soft dry cloths should be so placed that they will absorb all liquids which may flow from the body. Before it is dressed for the grave, a towel, folded in length, should be placed between the buttocks and should be confined by a napkin applied as upon the person of a child. When the body is placed in the casket, which should not be long delayed (although indecent haste is reprobated), a quantity of copperas should be placed under the hips and in such position that it will act upon any fluid which may escape. The casket containing the body should be placed in a cool, well ventilated apartment. Should it be desirable that the body be surrounded by ice, it will be necessary to treat the ice, the water which will result from its melting, and the box in which the body is placed, as if they were cholera discharges in the one case, and articles soiled with cholera discharges in the other.

The chamber which has been used during the illness should now be closed as completely as possible, and should, with its contents, be subjected to an active disinfection with sulphurous acid gas, which is to be obtained by burning sulphur. The room should remain closed for at least twenty-four hours.

While this work is going on, a fresh supply of the acid liquid should be prepared, and into it all the articles which have been soaking in that first prepared should be removed, and after remaining in it a few hours, they may be removed and washed in pure water. Valueless articles should be destroyed by fire; no useless memento of the case should remain. All fluids which have been employed in this work of disinfection must be disposed of in the manner indicated.

At the end of twenty-four hours, the chamber which has been undergoing disinfection may be opened and ventilated. The furniture should be removed and the floor and walls carefully cleaned.

Carpets and curtains should be beaten and well aired, and the solid articles should be washed in the acidulated solution. Then the room will again be ready for occupancy.

Should the attack not be fatal, and the patient pass into the slow and uncertain stage of convalescence, it becomes necessary to exercise still greater care to prevent the formation of the infectious property. The involuntary discharges have ceased, and if the bed has been arranged as directed, it will be possible to do much toward improving the local condition of the patient. By drawing upon the under sheet, he may be moved to one side. The oil-cloth then can be carefully sponged with the acid solution, and all points of moisture found on the mattress can be saturated with the same. Dry and well warmed blankets should be placed upon the bed, and the patient, having had his soiled clothing cut from him, his body bathed in the acid solution and enveloped in flannels (all of which may be accomplished in less time than it takes to describe it), is to be lifted and placed, without the expenditure of an ounce of the strength which is now of such vital importance, in a dry, warm, comfortable bed. When that is done the first step is taken toward success—but how seldom is it thought of! The writer has many times stood beside the beds of individuals who had passed safely into convalescence from violent attacks of cholera, and found that the patient was lying upon beds and surrounded with clothing covered with decomposing "cholera stuff." A more pitiable sight can hardly be conceived. Not infrequently we hear of persons who die from a relapse of cholera. It is no relapse of which they die. It is nothing more nor less than a new attack of the disease, occasioned by a second poisoning with cholera, the specific poison of which has developed from the excreta of their own bodies.

During the stage of convalescence all of the discharges from the patient must be treated as if they were fresh cholera stools.

Treatment.—In view of the rapid course, and often the fatal character of this disease, although competent medical advice is at once demanded, it is not always obtainable, especially when many miles intervene between the person affected and the nearest available physician. It is therefore evident that instructions should here be given regarding the things which may be done without loss of valuable time.

An individual suffering from diarrhœa, which may be suspected as being premonitory of an attack of cholera (and when the disease is known to be in the country, every diarrhœa should be viewed with suspicion), must immediately assume a recumbent posture, and remain absolutely at rest until the diarrhœa is

checked. By rest, it is not intended that the patient should lounge idly about; but he should undress, go to bed, and there remain absolutely quiet until he has received medical attention. Until such time as the physician arrives, he may take a teaspoonful of paregoric after each action of the bowels, and he should drink freely of any acidulated water, as lemonade, a solution of citric acid, or vinegar and water.

In times of cholera danger, every family should be provided with a cholera prophylactic—that is, a preventive remedy which, with the approbation of the family physician, may be used as necessity may demand. A mixture of aromatic sulphuric acid and laudanum is about the most efficacious which can be employed. It may be prepared in the proportion of one ounce of the acid to half an ounce of the laudanum, and the dose for an adult will be thirty drops, for a child over ten years of age, ten drops, and for a child under ten years of age, five drops, in a little water every one, two, or three hours, as occasion may require. It has been demonstrated by experience, that in the great majority of cases the premonitory diarrhœa will be checked by this treatment.

Should it be, however, that the first knowledge of the case is when it has reached the second stage, or that of the rice-water discharges, early and prompt treatment is of vital importance. The patient should be placed in bed, and every convenience furnished him which may serve to husband his strength. It is now imprudent to give opium in any form, except under medical advice; but acids should be promptly given. Where access can be had to a drug store, a supply of *dilute* sulphuric acid should be obtained, and thirty drops, or half a teaspoonful, in a wineglassful of water should be given every fifteen or twenty minutes, until the discharges are arrested. The dose for a child over ten years of age would be fifteen drops, and for one under ten years, ten drops. Until the acid can be obtained, vinegar, in teaspoonful doses, should be given every ten or fifteen minutes; and this course of treatment should be continued until a sufficient amount of the acid has been taken to change the contents of the stomach and intestines from the alkaline to the acid state.

A broad flannel bandage should be passed around the person and over the abdomen, and tightly pinned. A coarse towel should be compactly folded, and should be tightly pressed against the anus, that it may act as a plug, and the patient should be encouraged not to yield to the inclination to empty the bowel.

It is as possible to destroy the cholera poison within the human intestines as it is to destroy it in any other locality. To my medical brethren I would suggest the employment of pure sulphurous

acid, as a remedy from which good results may confidently be expected.

These are the measures which science advances for the destruction of epidemic cholera. The subject has been treated in detail, and it may seem that a needless reiteration of principles has been made ; but the success of the method depends upon the faithful performance of each and every detail. It may be urged, and with truth, that the method laid down, is within the grasp of the wealthy alone ; that the poor, those in moderate circumstances, are those among whom cholera epidemics most frequently commence, and that such individuals will be unable to avail themselves of it. In all communities, the rich and the poor are mixed together, and the treasure of one class must be freely used to relieve the necessities of the other. It is no question of philanthropy, but it is one of life or death. The rich man's money may save his life, or the lives of his wife and children, if he employs it in stamping out the disease in the hovels of poverty. Cholera gives no quarter, therefore all should join in giving it the *coup de grâce.*

ELY McCLELLAN, M.D.

Hydrophobia and Rabies.

This is one of the most dreadful of the diseases known to man, and until within a few years it has been so rare in its occurrence that it has generally been considered a danger too remote to require special care or special legislation as a protection. Recently, however, there has been an astonishing increase of hydrophobia, both in this country and in Europe. During the year 1877, six persons died of this disease in the State of Connecticut alone, while in the first six weeks of 1878, the writer has noted no less than eight deaths occurring from this cause in four of the New England States, and mention of such cases is constantly being met with in the daily journals. Recent cases have not only proved the existence of this disease in many animals other than dogs, such as the wolf, fox, skunk, and cat, but they have shown that creatures hitherto unsuspected, have the disposition and ability to communicate the disease to man. A well authenticated case recently occurred in Northern Ohio, where a rabid gray fox was seen to bite several hogs which were confined near a dwelling-house, and one of these animals afterward bit a young man who died of hydrophobia. In January, 1878, a gentleman in Boston was bitten

upon the finger by a tame rabbit, and in less than six weeks he died of hydrophobia in its worst form. The rabbit was known to have been bitten by a dog which died shortly afterward, and it is probable that the disease always originates in animals of the dog family. Twenty-five years ago the disease was so rare that the writer went nearly one hundred miles to see a case of genuine hydrophobia, and at the bedside of the patient he met medical men who had come even greater distances to see this rare and frightful disease. After witnessing the horrible contortions and terrible suffering of a victim of hydrophobia, one cannot wonder that less than two centuries ago the ignorant masses of Great Britain, panic-stricken with fear of contagion, should have smothered the wretched patient between two feather-beds, both to end his torment and to secure their own safety.

As this is a practical work intended for practical readers, the writer proposes to describe rabies as it occurs in the dog, and the hydrophobia which ensues when a human being is bitten by a mad dog. This is done partly for the reason that the disease when it occurs in the dog may be detected in its early stages, and before there is much likelihood of its being communicated.

The cause of the recent increase in these diseases is attributed, mainly, to the increase in the number of dogs kept, which is proportionately greater than the increase in population. It is also partly due to inadequate legislation and to almost criminal laxity in the enforcement of such laws as we have. In almost every State there is a periodical scare, when general statute and city ordinance as to license and muzzling are enforced in a spasmodic manner for a short time, but when the scare is over the dog increases and multiplies, all untaxed, and goes unmuzzled to its heart's content. Statistics show that in one municipality in the north of England during the year 1876, one man in five was bitten by dogs (twenty per cent. of the population), while during the same year in ten counties in Scotland one thousand sheep were killed by dogs. It is a well known and admitted fact that in the States of New Hampshire, Vermont, and New York, a majority of farmers have been obliged to give up the once lucrative business of sheep-breeding, owing to the increase in the number of dogs, and their ravages among the flocks.*

*[Germane to this subject, is the statement of Dr. Alexander Hadden, of New York City, based upon observations made by him while sheep-raising in his younger days, that castration of the male dog destroys his sheep-killing propensity by depriving him of the desire for the company of other dogs. He says that a solitary dog never engages in this relic of his wolfish state, but that when he sets out on one of these forays, he first associates with him some other dog, who, when the pasture is reached, may or may not en-

It is claimed by a recent and eminent authority, that the marked increase in rabies is caused by the great disproportion which exists in the sex of dogs, the males far outnumbering the females, and he asserts that in Africa and India, where the females are not destroyed, rabies is unknown. He also refers to the fact that ungratified sexual instinct does undoubtedly cause a sort of periodic madness in certain wild animals—notably the elephant and the deer. However this may be, the over-stocking with dogs in our own country being admitted, and the animals being plentiful everywhere about us, how shall we know when a dog has rabies, in order that we may protect ourselves and our families by securing the diseased animal in season?

The writer has recently had an opportunity of seeing a dog which undoubtedly suffered from rabies for a week before it died, but in describing the symptoms of the disease he will also draw largely upon the graphic account of rabies by the venerable Dr. Gross, of Philadelphia, and a more recent description from the pen of Dr. Watson, of London. This last author, in his admirable article upon hydrophobia and its prevention, says that "It is well to bear in mind the distinction between that disease in the human species, and *rabies* in the canine." He argues that there would be no hydrophobia were there no rabies; there can be no rabies unless it be communicated by a rabid animal—the word rabies simply meaning mad or rabid. But they are not identical diseases, for rabies in the dog is quite distinct from hydrophobia in man. The term hydrophobia is often erroneously applied to both maladies, but the rabid dog is never hydrophobic; *i. e.*, he never fears water. The writer of this paper cannot quite agree with one statement quoted above, for it is not yet proven that rabies only occurs by inoculation, that is, by one dog biting another, and so on, for many scientists distinctly declare that it does happen spontaneously and is developed by some unknown cause. Another erroneous impression also prevails very generally, viz.: that it usually occurs in hot weather, "dog-days," so called, whereas the fact is just the reverse, for a careful examination of newspaper files for the

gage in the destruction of the sheep; but one or the other of the pair is quite as likely to lie in the shadow of some bush or fence and watch the other in his onslaught. Bitches are very apt to go with other dogs on these excursions, but they do so most often as observers and not as active participators in the hunt. Dr. Hadden also states that he has never found castration to destroy the value of the dog either for hunting or other purposes, but that it abolishes the sexual instinct only, and therefore renders him unlikely to engage in these wild hunts. The loss of desire to associate with other dogs would, moreover, render the castrated animal less liable to contract rabies from the bites inflicted by one running wild.—ED.]

past ten years show a larger proportion of cases during the cold months.

Symptoms of Rabies in the Dog.—During the month of February and the first week of March of 1878, an epidemic of rabies existed in the city of the writer's residence, having started from a large English pointer dog, whose madness was *apparently* spontaneous. This dog, in five days, was known to have bitten more than one hundred dogs within an area of ten miles. Several of the dogs so bitten afterward became rabid and were killed, while others, at the time of writing, are now showing the preliminary symptoms of the disease. The history of the madness as it was developed in the case of this pointer, proves it to have been a typical case, as he had nearly all the symptoms described by Dr. Gross and Youatt, and some few which they do not mention. This dog was a quiet, peaceable animal, trained for bird-hunting, and, like most sporting dogs, an arrant coward, always avoiding a fight by running away, or refusing to defend himself if caught and attacked. Early in February he was observed to be restless and sullen, paying no attention to the voice of his master, but wandering about the house and grounds in an uneasy manner, occasionally *throwing* himself rather than *lying* down, then starting up again and resuming his purposeless walk. At times he seemed to be gazing at something in the air with his eyes wide open and the pupils dilated, and again, with contracted eyelids he seemed to be *squinting* at some object he could not see distinctly. Something about one ear annoyed him very much, for he was constantly scratching it with one hind foot, but careful examination revealed no wound, scar, or disease of the skin. He refused food from the very first, but would drink water eagerly, which, after a few minutes, was usually vomited up. The morning of the third day he was seen to grasp the leg of a coal-stove in his teeth, and to chew instead of biting it, and a few minutes afterward he seized a bit of iron that lay upon the floor and attempted to swallow it. A bit of anthracite coal next attracted his attention, and this he swallowed at once. Subsequently he swallowed lumps of manure, chips, lumps of ice, the peelings of vegetables, and garbage of all kinds, but nothing in the way of food. The owner attempted to tie him up the forenoon of the third day, but before he could be secured he escaped from the stable and begun "running a-muck," biting every dog he could catch, but devoting only a moment or two to any one dog unless it happened to be a very small one, when he would seize it by the back and carry it some distance before dropping it. One very small tiny terrier was thus carried for a dozen or more rods and only dropped when the owner pur-

sued and attacked him with a club. He seized the end of the club and bit it savagely, but did not offer to touch the man. It was noticed that when he thus picked up a small dog he invariably chewed it during the whole time he had it in his mouth.

Upon one occasion he overtook a small company of half a dozen dogs of various sizes ; the large ones he simply bit once and then left them for another, but a small dog was carried some distance and chewed as described above. One dog ran from him and sought refuge upon the piazza of its master's house. The rabid dog pursued and caught it, and was chewing it when a woman hearing the outcry came out and attacked the pointer with a broom. He dropped the terrier for a moment, seized the broom in his teeth and worried it as a dog does a rat, but the instant the broom was snatched from his mouth he again attacked the little dog and was with difficulty driven off. Toward night he returned to his master's house completely exhausted, and allowed himself to be tied up in an outhouse. It was noticed at this time that there was a very copious flow of saliva from his mouth, and that he was suffering from an accumulation of a sticky, tenacious phlegm or mucus in his throat, which he would try to eject by retching and working about the corners of his mouth in a frantic manner with both paws, as though he were trying to pull something out which choked him. He was evidently very thirsty, for he made eager attempts to drink, but most of the water was wasted from the irregular motion of his tongue in lapping it. There was also a spasmodic twitching of the muscles about the head and neck, like that seen in a dog after partial recovery from a dose of strychnine.

At this time the animal was secured by two ropes attached to his collar, one of them very large and both hard and well twisted. When his master opened the door of the stable the next morning, the dog rushed past him into the street with fragments of both ropes attached to his collar. During this day he was seen chasing and biting dogs four miles from the city upon a road that leads to the north ; two hours later he was again pursuing his victims in the streets of the town, and still later he was seen in the streets of a village seven miles from town due west ; being easily recognized by his persistence in following and biting other dogs, and by the bits of rope he carried upon his neck. Late in the afternoon he made his way home with a staggering, uncertain gait, and with still more of the spasmodic twitchings of the muscles. For the first time he was cross toward the children of the family, giving vent to a hoarse growl when interfered with, but he permitted a young girl of twelve to tie him securely, this time a chain being used instead of a rope. There was some paralysis of the hind-

quarters, as they frequently gave way under him when he attempted to walk. There was the same vacant stare and following of some illusory object in the air with his eyes, and the same depraved appetite for excrement, etc., as before. During this last raid he was seen to bite a pig and a hen, and shortly after he was chained up he sprang at and attempted to bite a horse which was led past him. He also seized and savagely bit the runner of a sleigh while in motion near him, and for the first time made an attempt to attack his master, but was restrained by the chain.

The tongue was now so much paralyzed that he could drink no water, and the saliva absolutely poured from his mouth. His eyes were constantly in motion and apparently bloodshot. The morning of the fifth day he was attacked with spasms and was mercifully despatched. One of the dogs bitten by this animal began to suffer from rabies in a fortnight from the time he received the injury, and the third day afterward bit a young woman severely through the base of the thumb. At present writing she has suffered no inconvenience, and the wound has healed kindly.

Youatt's description of rabies in the dog is so true and so graphic, that it is quoted entire. He says . "In the greater number of cases there are sullenness, fidgetiness, and a continual shifting of posture. For several successive hours, perhaps, he retreats to his basket or his bed. He shows no disposition to bite, and he answers the call upon him laggardly. He is curled up, and his face is buried between his paws and his breast. At length he begins to be fidgety. He searches out new resting-places, but he very soon changes them for others. He takes again to his own bed, but is continually shifting his posture. He begins to gaze strangely about him as he lies upon his bed. His countenance is clouded and suspicious. He comes to one and another of the family, and fixes on them a steadfast gaze, as if he would read their very thoughts. 'I feel strangely ill,' he seems to say; have you anything to do with it? or you? or you? Has not a dog mind enough for this? If we have seen a rabid dog at the commencement of the disease, we have seen this to the life. Delirium is an early and characteristic symptom; the dog sees imaginary objects, and often springs at them with a furious dart, he is restless, and excessively irritable, gazing wildly around and snapping at everything within reach. The saliva is secreted profusely, and collecting at the corners of the mouth, the animal makes frequent attempts to detach it with his paws; his appetite is strangely perverted, and he will sometimes greedily devour horse-dung, or even his own excrement; the voice is changed in character,

being generally hoarse, and more or less shrill; the eyes are singularly bright, and the thirst is intense and insatiable, the dog drinking frequently and having no fear whatever of water, as is not the case with the human subject. The disease now tends rapidly to a fatal issue. The muscular power being greatly exhausted, the animal finds it difficult to sustain himself upon his limbs; he reels and staggers about like a man in a drunken fit; his tail is depressed and his tongue protruded; the eyes have lost their brightness, and are of a dull, glassy appearance; the breathing is hurried and panting; finally, worn out by his sufferings, the poor creature dies, either from convulsions or from exhaustion, the attack having lasted from three to five days." Youatt adds, that "the power of giving the infection exists in all the confirmed stages of the disease, and continues even for twenty-four hours after the death of the animal."

Dr. Watson, of London, adds to these symptoms, "a slight squinting of the eyes and twitching of the face; an earnest licking of some part on which a scar may generally be found; if the ear is the affected part, he scratches it incessantly and violently; if the foot, he gnaws it until the skin is broken. Occasional vomiting and depraved appetite is noticeable; then the animal becomes irascible and flies at strangers; is impatient of correction, seizing the whip or stick; quarrels with his own companions; eagerly hunts and worries the cats; demolishes his bed, and if chained up, makes violent efforts to escape, tearing his kennel to pieces with his teeth. If at large, he usually attacks such dogs as come in his way, but if naturally ferocious, he will diligently and perseveringly seek his enemy."

Dr. Watson quotes Mr. Youatt as saying, that in his opinion "the dog is subject to what we call 'spectral illusions;' he starts up and gazes earnestly at some real or imaginary object. He appears to be tracing the path of something floating around him, or he fixes his eyes intently on some spot on the wall, and suddenly plunges at it; then his eyes close, and his head droops. Frequently, with head erect, he utters a short and very peculiar howl; or if he barks, it is in a hoarse, inward sound, unlike his usual tone. The breathing is laborious, and the drawing in of the breath attended with a singular grating, choking noise."

Billroth, a distinguished German surgeon and writer, says, "We distinguish a raving and a quiet madness; previous to both of them the dog is downcast and eats but little. After this state has lasted a week, the raving madness begins; the dog runs about in a purposeless, objectless manner, apparently urged by some inward anxiety; if irritated, he bites at anything that comes in his way;

the mouth is dry, etc. ; he emaciates, he totters, his hind legs become paralyzed, and in three or four days he dies."

Upon making an examination of the bodies of dogs dying from rabies, nothing unusual is found, except a certain amount of inflammation of the stomach, due, no doubt, to the various foreign bodies the dog has swallowed. This fact, however, is important, as affording a satisfactory test in the case of an animal suspected of rabies, for if, after death, we find this inflammation, and especially if the stomach contains such substances as coal, hay, or straw, sticks, horse-dung, iron or lead, as well as a quantity of a dark fluid, like thin molasses, which, in fact, is altered blood, we may fairly conclude that the dog was mad.

The writer has been thus prolix in describing the symptoms of rabies in the dog, because he deems it of vital importance that his non-professional readers should be able to recognize the disease in season to protect themselves and the community from the possible results of a mistake or an oversight in this matter.

Mode of Communication.—The virus of rabies resides in the saliva, or in the saliva mixed with other fluids of the mouth and throat. This fact has been established by experiments made upon the lower animals. Thus a dog, cat, hare, and hen were inoculated with the saliva of a rabid dog, and the disease followed in every case. A sponge wet in the saliva of a mad dog was rubbed upon a sore on the back of a sheep, and the animal subsequently perished from rabies. A silk thread wet in the fluid from the sore upon the sheep was drawn through a bit of skin upon another sheep, and the disease was again communicated. The disease has been repeatedly provoked in dogs by inserting the saliva of rabid horses and asses. It is, however, still uncertain whether the disease can be communicated from one person to another. An assistant in one of the English hospitals was bitten by a patient laboring under hydrophobia, but no ill effects followed. Dr. Gross says that rabbits, fowls, etc., die from inoculation with human saliva without exhibiting any of the ordinary symptoms of hydrophobia. It must be kept in mind that hydrophobia means simply "fear of water," and that man alone develops this symptom. Youatt decides the question in the affirmative, and says that the saliva of a human being suffering from hydrophobia can undoubtedly convey the disease to another human being, but the context leads us to suppose that the saliva must come in contact with a sore or scratch, or some abrasion of the skin. Dr. Watson agrees with Youatt, and cautions the friends of hydrophobic patients to guard against the contact of the saliva with any sore or abrasion of the skin, or with the inside of the mouth and

nose, as he infers that the mucous membrane may also absorb the poison.

Dr. Watson relates the result of an experiment, which certainly confirms Youatt's theory. Two healthy dogs were inoculated with the saliva of a patient in one of the Parisian hospitals, who died the same day. One of these dogs became mad forty days afterward. This dog was allowed to bite others, which in their turn became rabid also; and in this way the malady was propagated for several months. Although these facts do not fully settle the question, still the results are sufficiently startling to warn us against any carelessness in treating or nursing a patient sick with hydrophobia. In fact, every precaution should be taken to guard against contagion, while the unhappy patient should be dealt with gently, and his every wish gratified as far as is consistent with the safety of others.

The inoculation in hydrophobia is usually effected by a tooth, which, however, need not necessarily penetrate deeply, as the disease may be communicated by the slightest scratch. One case is reported where death was produced by the licking of a wart upon the face, by a little poodle supposed to be mad. Although it is probable that the true skin, when sound, does not absorb the poison, it seems that the mucous membrane does. A man endeavored to untie a hard knot by the help of his teeth. Eight weeks afterward he died of hydrophobia. It was then discovered that a mad dog had been tied with this cord. A woman was attacked by a rabid dog, but escaped with some rents in her gown skirt. In the act of mending it, she pressed down the seam with her teeth. She also developed hydrophobia and died. Horses have died mad after eating straw upon which rabid pigs had lain. As regards the transfer of the poison of hydrophobia to man, it is a relief to know that all who are bitten do not contract the disease, the saliva containing the virus no doubt being wiped off as the teeth penetrate the clothes. Where the teeth pass through leather the immunity is even greater. No accurate statistics of the percentage of deaths to the number bitten are attainable. Authorities vary considerably, from one in thirty, twenty-five, and twenty, down to one death in fourteen cases, but even the last average is probably too low. One of the earliest recorded series of cases gave twenty-one bitten, and only one death. Another with fifteen bitten gave three deaths.

The saliva of the rabid wolf would seem to be highly virulent, for, of twenty persons bitten by a mad wolf in 1774, in France, nine died. In 1817 twenty-three persons were bitten, and fourteen perished. Four out of eleven, and eighteen of twenty-four died

who were bitten at different times near Rochelle in France. Still later, nineteen were bitten, of whom twelve died within two months. In all, one hundred and fourteen persons were bitten by rabid wolves, and among them sixty-seven fell victims to hydrophobia. These beasts, it is said, always fly at a naked part, and hence the fatality of their bites. There is no doubt, however, that the majority of persons bitten by mad dogs escape the disease. It is probable that some persons are not susceptible to the poison in a high degree, for, of seventy-five persons bitten in this country, a majority did not take the disease, notwithstanding that in forty of the cases the bite was upon the hand; on the face in fifteen, on the leg in eleven, and on the arm in nine; or to sum up, fifty-five were bitten upon naked and exposed parts against only twenty bitten through the clothing. The facts are stated with the hope of modifying the nervous depression and abject fear that ensues when one is bitten, the case being regarded by the victim as hopeless, and hence a state of mind ensues that actually invites the disease. Take the proper precautions and apply the appropriate remedies, if bitten, but determine at once that you belong to the majority, and that hydrophobia is not to be your portion.

If a person bitten by a dog supposed to be rabid cannot take this hopeful view of his case, another and most anxious inquiry next arises, viz., *how long does the danger of hydrophobia continue?* When is the peril fairly over, and after what lapse of time may the injured person lay aside all apprehension of the disease? Unfortunately, no satisfactory reply can be given. Dr. Watson says that in a vast majority of cases the disorder has broken out within two months of the bite. But he admits that the exceptions to this rule are very numerous. Two of the three cases treated by Dr. Gross developed at the end of four weeks, and the third did not manifest itself until nine months after the bite. In eighty-nine cases analyzed by Dr. Blatchford, the average period was about seventy days, the minimum in twenty-three cases was thirty days, and the maximum time six months and twenty days. Many well-authenticated cases give a wide range of time, as for example—one in seven days; one in thirty days; one in eighteen months; one in four years; one in five years; one in nine years, and one in twelve years; but Dr. Watson argues of the last five cases quoted, that some unsuspected inoculation must have occurred, some fresh application of the poisonous virus; and this he states, notwithstanding the fact that the man who died of hydrophobia at the expiration of seven years had been closely confined in prison for more than two years prior to

the invasion of the disease, where he was out of the way of dogs altogether. The investigations of different observers have proved only two facts of value in this direction—viz., that the time elapsing between the bite and the disease is considerably shorter in animals than in man, and in very young persons than in adults.

Hydrophobia is not peculiar to any age, as it has been observed in infants at the breast, and in every period of adult life, even to second childhood. Neither has sex any influence, although for obvious reasons women are less exposed to the bites of rabid animals than men. It prevails in most, if not all countries, and at all seasons of the year.

Another curious question also remains unanswered, and that is, where is the virus or poison hidden during the irregular period between the bite and the disease? Writers have expressed a variety of opinions, some locating it in the scar; some in the glands; some in the blood; and some assert that it may become enclosed in a little sack which finally is ruptured, letting the poison free to be absorbed into the general circulation, and thus begin its deadly work weeks, months, or years after the bite.

Symptoms of Rabies in Man.—The wound inflicted by a rabid animal usually heals kindly like any punctured wound, the scar, perhaps, remaining a little red and tender, as it does after an ordinary bite, but the system exhibiting no sign of disease. After a longer or a shorter time, when hydrophobia is about to develop, the part begins to itch, burn, or smart, and soon becomes sore and irritable, hot, numb, or rigid; pain darting through it in different directions, and sometimes extending to a considerable distance beyond the site of injury, as from the hand to the shoulder, or from the foot to the knee or groin. Sometimes a red line may be traced from the scar either up or down or in both directions, and sometimes, though rarely, the old scar opens, developing an unhealthy looking sore. About this time the patient feels unwell generally; his head aches, and he has unpleasant dreams; he feels melancholy and depressed, and has occasional chills, while the system is in a highly nervous and excited condition.

The poison, says Gross, is now fairly at work, and in a few hours —generally from ten to twenty-four—it explodes with frightful violence. The disease has now reached its second stage; the dread of water and the difficulty of swallowing have declared themselves; in a word *hydrophobia* is fully established. The patient on attempting to drink is suddenly seized with a spasm in the throat, and finds he is unable to swallow a particle of fluid; he tries and tries, but every effort is only succeeded by a renewal of suffering, and presently he dashes away the cup as if it were

charged with some deadly poison, unwilling again to bring it to his lips. Though tortured with thirst and the dryness of ashes in his mouth, he will endure this rather than subject himself to the dreaded spasm. Should he succeed in forcing down a few drops, he will instantly be seized with a choking cough, convulsive twitchings, and lividity of the face, forcing him to jump up in bed and to pant for breath.

He complains of a sense of constriction in his throat and chest; says he cannot breathe and sighs often and deeply; has a frequent desire to clear his mouth of a thick and tenacious saliva, which greatly aggravates his sufferings. He now begins to complain of the air in the room, the slightest contact with cold air being a source of profound torture; the agony thus caused being greater than that occasioned by the attempt to swallow fluids. The opening of a door, the slightest movement of a fan, or even the slightest whiff of air directed from the attendant's mouth upon the body, instantly brings on a paroxysm of this kind. Light and noise too are always offensive, and hence the patient usually insists upon the room being kept dark, quiet, and closed.

The mind is now peevish and fretful, and nothing that can be done pleases the sufferer, who, in consequence, often quarrels with those who are nearest and most devoted to him. Sometimes the imagination is wholly perverted; he fancies that he hears noises and sees objects that have no existence; he gets out of bed, walks about the room, screams or gesticulates like one affected with delirium tremens.

The above are the symptoms generally seen in this stage and so well described by Gross, from whom most of this description is borrowed, but there are numerous exceptions. The case seen by the writer many years ago was one of these, for so far from being irritable or unreasonable, his only fear was that he might injure his friends, and he would actually ask to be properly secured so that no accident could possibly happen during the paroxysms. His mind was apparently clear even when he was suffering the most, and the efforts he made to suppress any manifestation of the agony he was enduring were extremely touching. We now come to the third and last stage, which is characterized by an aggravation of all the previous symptoms: the countenance has a haggard and distressed appearance, horror and anxiety being depicted on every feature. The pupils of the eyes are dilated, and the eyes have a wild, glaring expression; the tongue is dry and parched; the voice is hoarse and shrill, so much so, that it strongly resembles that of a dog; the breathing is short and panting: more or less delirium is present, often amounting to complete

mania; the strength is much impaired, and the pulse, small and feeble, beats from one hundred and thirty to one hundred and sixty in a minute, which is very rapid, as the natural pulse is only about seventy-two to the minute; paroxysm after paroxysm recurs, until the frame is worn out by exhaustion, and death mercifully closes the scene, usually in a sudden fit of suffocation. Sometimes a calm is experienced a few hours before death; the spasms subside, the power of swallowing returns, the mind becomes clear, and the patient sinks, perhaps, into a tranquil sleep, from which he awakes only to pass away quietly and peacefully. The duration of the attack varies from eighteen hours to a week, the average being about three days. Many other symptoms have been observed from time to time by different observers, but as this work is not intended for medical readers, a general description is deemed sufficient. No intelligent person could possibly mistake the disease after reading the concise but graphic description from the pen of Dr. Gross, the most of which has now been given. It is only necessary to bear in mind the dread of water, the difficulty of swallowing, and the suffering caused by contact with a current of cold air, to enable any person to recognize a case of hydrophobia, even when no history of a previous dog-bite can be obtained. It is almost unnecessary to add that the disease is always fatal, as there is no reliable history of a case of recovery upon record.

Treatment.—The secular papers occasionally give the details of remarkable cures effected by such remedies as "elecampane," "arsenic," etc., but none of them have stood the test of scientific scrutiny. No attempt will or should be made in a work of this practical character to give any directions for the treatment of hydrophobia, as this disease, more than almost any other, comes exclusively within the domain of medical practice. Even the most skilful physician can do little, except to palliate and relieve, and to effect this, opium and morphia are given either by the mouth or by injection, and ether or chloroform by inhalation. In an emergency, any or all of these may be used to the extent of quieting the sufferer, but a physician should always be summoned if within reach. The friends of a person afflicted with hydrophobia should guard themselves while caring for the patient, taking care that he does himself no injury in his frightful paroxysms, and avoiding all contact with the saliva he throws off so freely, and which, according to all reliable authorities, is either the propagating virus itself, or else serves as a vehicle for it.

The important question to be considered is the treatment of the bite of a rabid animal, whether dog, cat, or fox. Dr. Watson's

plan of establishing a quarantine for all the dogs in Great Britain, and keeping them closely confined for eight or ten months, is not practicable, in this country at least, and he also assumes that rabies is only propagated by contagion, and that it is never developed spontaneously, which proposition is by no means conceded. A criticism in a New York journal upon this idea of Dr. Watson suggests that measles and scarlet fever might as well be obliterated from off the face of the earth, and advises that all the children in the land be tied up and isolated for a year, simply to try the experiment. As the isolation of the children is about as probable as the quarantine of the dogs, let us consider what shall be done when one's self or one's friend is bitten by an animal supposed to be mad.

The first question which arises is, should the bitten person, or a friend for him, suck the wound, and thus try to draw out the venom? The answer to this from both Youatt and Watson is decidedly *No!* The danger of infection through chapped or abraded lips, tongue, or mouth, is too great to permit the risk. The very first thing to be done, if the bite is upon a limb, is to put on a ligature of some kind, such as a cord, shoe-string, handkerchief, cravat, or a strip from the underclothing, between the wound and the heart, and to draw it tightly enough to shut off the superficial circulation at least. A stick inserted in or under the ligature and well twisted, adds to the efficiency of the measure. Then, with a sharp knife, cut out every tooth mark, being sure to include some sound flesh all around and below the wound. This must be done as thoroughly as recommended in the section upon Snake Bites, and the same expedient may be used to secure thoroughness, viz., insert a little plug, whittled to fill the tooth wound, and then make two elliptical cuts, one each side of the wound, bringing the ends together, and making the two cuts meet below the wound, so that the entire depression made by the tooth will be removed with a considerable thickness of sound flesh all around it. Every tooth mark must be thus treated, and then bleeding should be encouraged by cupping or the application of warm water, while the ligature about the limb may be loosened a little to secure more profuse hemorrhage. When this has lasted for some little time, the surface of the wound or wounds may be dried, and the parts thoroughly cauterized. The best material for this part of the treatment seems to be the ordinary lunar caustic. Youatt, who trusted to this agent, was bitten seven times and escaped, and he assures us that he had operated with lunar caustic upon more than four hundred persons, all bitten by dogs unquestionably mad, and that he did not lose a case. A distinguished London surgeon in charge of a large hospital asserts that ten times that number had been

treated at the hospital by the cutting and bleeding treatment alone, without a single fatal case, but he admits that all the dogs were not known to have been rabid. Now, if to the free cutting out of the wounded parts, the thorough burning with lunar caustic is added, the bitten person must secure the maximum of safety. Bear in mind, that to be efficient, the ligaturing of the limb, and the cutting out of the wound, or the latter alone, if the bite is upon the face or trunk, should be *instantly performed.* If the bitten party is alone, and without a knife, he must apply the ligature as thoroughly as possible, and procure aid in making the excision as soon as may be. When the cutting and consequent bleeding has been thorough, he can afford to wait a short time until a physician or the caustic can be procured. A French physician prefers the treatment by actual cautery, that is, the destruction of the poison and the tissues of the bitten part, by searing them with a red-hot iron ; and a person might be bitten under circumstances where this would be the readiest and the safest course to pursue. The poison would undoubtedly be as thoroughly destroyed by applying strong nitric acid (aqua-fortis) to the interior of the wound, but even then it would be wise to cut the wound out first, and apply the acid afterward. If the teeth of the rabid animal have penetrated between two bones, as, for example, when the bite has been inflicted upon the hand, the cutting out must be performed with care, otherwise a portion of the virus will be left behind. It may become necessary to remove a portion of the bones also, for, as Dr. Gross well remarks, any local sacrifice is justifiable to secure immunity from so horrible a disease. The patient should cheerfully consent to the amputation of a limb even, if his safety demands it. If possible, the cutting and cauterizing may be performed while the patient is under the influence of ether or chloroform, or the spray of ether from an atomizer, or even from a syringe, may be thrown upon parts [or a lump of ice, or ice and salt may be used to freeze the skin] to secure local insensibility to pain during the use of the knife and caustic, but no time should be wasted in waiting for the arrival of the ether or chloroform. The subsequent treatment of the wounds made by the knife should be that of any open wound, viz.—the poultice, often changed—or the water dressing at first, and the warm poultice afterward, and perfect rest. The system should be supported by a generous diet, with stimulants and quinine, if necessary.

ALBERT H. CROSBY, M.D.

[Resumé of the Symptoms of Rabies in the Dog.

The following resumé of symptoms presented by a rabid dog is taken from the writings of Fleming, Youatt, and Bouley, and should become familiar to every person who keeps a dog, or is liable to be brought much in contact with the animal:

1. The disease is not characterized by fits of fury at its commencement, but is, on the contrary, to all appearance a benignant malady, though even then the saliva or foam is virulent or poisonous. The dog is, at this period, very dangerous, by its licking rather than biting, for as yet it has no tendency to use its teeth.

2. At the commencement of the disease the animal's temper becomes changed; it is dull, gloomy, and silent, seeks solitude, and withdraws into the most obscure corners. But it cannot rest long in one place; it is fidgety and agitated, goes here and there, lies down, gets up, prowls about, smells, and scratches with its fore-paws. Its movements, attitudes, and gestures at times would indicate that it is haunted by, and sees, phantoms; it snaps at nothing, and barks as if attacked by real enemies.

3. Its appearance is altered; it has a gloomy and somewhat ferocious aspect.

4. In this condition, however, it is not aggressive so far as mankind is concerned, but is as docile and obedient to its master as before. It may even appear to be more affectionate toward those it knows, and this it manifests by a greater desire to lick their hands and faces.

5. This affection, which is always so marked and so enduring in the dog, dominates it so strongly in rabies that it will not injure those it loves, not even in a paroxysm of madness, and even when its ferocious instincts are beginning to be manifested and to gain the supremacy over it, it will yet yield obedience to those to whom it has been accustomed.

6. The mad dog has not a dread of water; but, on the contrary, will greedily swallow it. As long as it can drink it will satisfy its ever-ardent thirst; even when the spasms in its throat prevent its swallowing, it will, nevertheless, plunge its face deeply into the water, and appear to gulp at it. The dog is, therefore, not *hydrophobic*, and *hydrophobia* is not a sign of madness in this animal.

7. It does not generally refuse food in the early period of the disease, but sometimes eats with more voracity than usual.

8. When the desire to bite, which is one of the essential characters of rabies at a certain stage, begins to manifest itself, the animal at first attacks inert bodies, gnawing wood, leather, its chain, carpets, straw, hair, coals, earth, the excrement of other animals, or even its own, etc., and accumulates in its stomach the remains of all the substances it has been tearing with its teeth.

9. An abundance of saliva is not a constant symptom in rabies in the dog. Sometimes its mouth is humid, and sometimes it is dry. Before a fit of madness, the secretion of saliva is normal; during this period it may be increased, but toward the end of the malady it is usually decreased.

10. The animal often expresses a sensation of inconvenience or pain during the spasm in its throat, by using its paws on the side of its mouth, like a dog which has a bone lodged there.

11. In "dumb madness," the lower jaw is paralyzed and drops, leaving the mouth open and dry, and its lining membrane exhibiting a reddish-brown hue; the tongue is frequently brown or blue-colored, one or both eyes squint, and the creature is ordinarily helpless and not aggressive.

12. In some instances, the dog vomits a chocolate or blood-colored fluid.

13. The voice is always changed in tone, and the animal howls or barks in quite a different fashion to what it did in health. The sound is husky and jerking. In "dumb madness," however, this very important symptom is absent.

14. The sensibility of the rabid dog is greatly blunted; when it is struck, burned, or

FIGURE 8. — A dog suffering from "dumb rabies," in which paralysis of the muscles of the mouth and throat prevent closure of the jaws.

wounded, it emits no cry of pain or sign as when it suffers or is afraid in health. It will even sometimes wound itself severely with its teeth, and without attempting to hurt any person it knows.

15. The mad dog is always very much enraged at the sight of an animal of its own species. Even when the malady might be considered as yet in a latent condition, as soon as it sees another dog it shows this strange antipathy, and appears desirous of attacking it. This is a most important indication.

16. It often flees from home when the ferocious instincts commence to gain an ascendency; and after one, two, or three days' wanderings, during which it has tried to gratify its mad fancies on all the living creatures it encountered, it often returns to its master to die. At other times it escapes in the night, and after doing as much damage as its violence prompts it to, it will return again toward morning. The distances a mad dog will travel, even in a short period, are sometimes very great.

17. The furious period of rabies is characterized by an expression of ferocity in the animal's physiognomy, and by the desire to bite whenever an opportunity offers. It always prefers to attack another dog, though other animals are also victims.

18. The paroxysms of fury are succeeded by periods of comparative calm, during which the appearance of the creature is liable to mislead the uninitiated as to the nature of the malady.

19. The mad dog usually attacks other creatures rather than man, when at liberty. When exhausted by the paroxysms and contentions it has experienced, it runs in an unsteady manner; its tail pendant and head inclined toward the ground; its eyes wandering and frequently squinting, and its mouth open, with the bluish-colored tongue, soiled with dust, protruding. In this condition it has no longer the violent aggressive tendencies of the previous stage, though it will yet bite every one—man or beast—that it can reach with its teeth, especially if irritated.

20. The mad dog that is not killed perishes from paralysis and asphyxia. To the last moment the terrible desire to bite is predominant, even when the poor creature is so prostrated as to appear to be transformed into an inert mass.—FLEMING.

"The idea that dogs are not rabid when they can drink and do not seem afraid of

FIGURE 9. — A dog in the furious stage of rabies.

water is . . utterly erroneous, and would appear to owe its origin to the presence of hydrophobia in man, which . . . is a marked symptom in him. Therefore beware of a sick dog, even when it drinks with avidity, for an aversion to water in rabies does not exist at any period of the disease.

Whenever a dog is observed to persist in tearing the carpets, cushions, and other articles in rooms; when it gnaws boards or the wood of its kennel; devours its straw, soil, etc., without exhibiting any tendency to bite people, it ought to be suspected; for these signs are but a prelude to those of a more serious character, and the poor animal is, in reality, venting that ferocity on inanimate objects which will soon be directed toward everything animated.

A sudden and strange alteration in the familiar voice of a dog should at once attract attention and elicit inquiry; the rabic cry or howl is a sure warning, and affords just grounds for alarm, as it is one of the precursory symptoms of the furious stage of the disease.

Suspicion should always attach strongly to a dog which does not manifest a certain degree of pain, and receives punishment without uttering any cry or complaint. When, for instance, a dog is pursued in a locality because it is without an owner, and is a stranger, if it remains mute, notwithstanding the menaces and the blows to which it is subjected, there is every cause for suspicion. There is also reason for apprehension when a dog bites itself persistently in any part of its body, and does not stop because of the pain it should experience.

When a dog . . . contrary to its habits and natural inclination, becomes suddenly aggressive to other dogs, it is time to take precautions. Such manifestations are very significant, and, if understood, they may be utilized in averting danger from other creatures.

We should always look with suspicion upon a dog which, after being absent from

its home for some days, returns again, and especially if it is emaciated and covered with mud, and perhaps with blood.

The dog, and at particular times, when he is more than usually salacious, may, and does, diligently search the urining places; he may even, at these periods, be seen to lick the spot which another has just wetted; but, if a peculiar eagerness accompanies this strange employment; if, in the parlor, which is rarely disgraced by this evacuation, every corner is perseveringly examined, and licked with unwearied and unceasing industry, that dog cannot be too carefully watched; there is great danger about him; he may, without any other symptom, be pronounced to be decidedly rabid. I never knew a single mistake about this.—YOUATT.

Distrust, says Bouley, a dog when it commences to be unwell; every sick dog should, as a rule, be suspected. More particularly distrust a dog when it becomes dull, morose, and seeks for solitude; which appears not to know where to rest; which is always on the move, prowling, snapping at the air, and suddenly barking at nothing, when all around is perfectly still; whose countenance is sombre and only assumes its usual animated expression by brief starts. Beware of the dog that seeks and scrapes incessantly, and exhibits aggressive movements against phantoms; and, finally, beware, above all, of the dog which has become too fond of you, and is continually endeavoring to lick the hands or face."—FLEMING, "Rabies and Hydrophobia," 1872, p. 197.

Glanders—Farcy.

This is a disease natural to animals of the horse family, but which may be communicated to other animals and to human beings. It is called glanders when it affects principally mucous membranes, and farcy when the skin is chiefly the seat of the disease. In either locality, the essential feature of the disease is the development of a number of lumps or tubercles, varying in size from that of a pin's head to that of a pea. These tubercles afterward open to the surface, giving origin to ulcers which resemble a chancroid (see chapter on Chancroid and Syphilis), and discharge a matter which varies in appearance and at different times; being like true matter, greenish, streaked with blood, or yellowish, and showing a tendency to form crusts or scabs about the margins of the sores. When the sores are close together they are apt to unite and form ulcers of irregular shape, which show little disposition to heal. The matter becoming mixed with the mucous from the nasal cavities (when this is the seat of the disease) causes a discharge from the nostrils, which is not often very considerable in amount, but which, when brought in contact with a scratch on the skin, or an abrasion of the mucous membrane of the nasal cavity, mouth, or eye of another person, is capable of reproducing the disease. When the disease mainly affects the skin the lumps are called "farcy buds," and these generally become inflamed, and burst, like boils, or form abscesses beneath the skin, sometimes of considerable size.

Horses are affected with a variety of the disease in which the

lungs are more particularly its seat, when there may be little or no nasal discharge, but the animal has a short, muffled cough, shortness of breath, and other symptoms which lead to the opinion that he suffers from "heaves," the true nature of his disease being overlooked.

When the nostrils are affected, the partition or septum is the place where the ulcers may usually be found. The discharge may be limited to one nostril, and is said to be always greatest on one side if the disease affects both. The lymphatic glands under the jaw and near the neck are always enlarged in such cases, the animal is feverish, and it is said that a sign of value is the rough and dingy appearance presented by its coat of hair.

The disease, as above intimated, may be communicated by inoculation with the discharges from the sores, but it is probable that in many cases, particles of the poisonous matter floating in the air may be inhaled and come in contact with the mucous membrane of the air-passages, and so cause the disease. This renders it important that every horse affected with a cough and having the other symptoms above described, should undergo a critical examination.

Grooms, and others whose occupation leads them to be much about horses, are particularly liable to infection with glanders; but instances are also known where persons crossing a street have been inoculated by the discharge blown into their faces by passing horses. This fact should render every person careful in approaching the head of a strange horse.

Symptoms in Man.—When human beings are the subjects of the disease, the nose and face are, for obvious reasons, the most common seat, although "farcy buds" also make their appearance in other localities. From one day to two weeks may elapse after infection before the disease makes its appearance. The patient then has a high fever, with occasional rigors, quick pulse, intense headache, and pain in the muscles and joints, profuse perspiration, and dark-colored urine. The mucous membrane of the nose soon shows signs of inflammation, and an eruption of red points appears on the skin, and afterward become tubercles or "farcy buds." The discharge from the nose, at first watery, soon becomes thicker, *sticky*, and profuse, and still later, greenish, or mixed with blood. The eruption is apt to be greatest on the face, and pursue a rapid course. The cavity of the mouth and throat become the seat of disease, the eruption on the face becomes a collection of spreading ulcers, the eyes are inflamed, the patient grows feeble and delirious; has "typhoid symptoms," as they are called, and stupor and death soon follow. In the latter stage of

the attack, the whole face and the mucous membrane of the air-passages partake in the diseased condition, and abscesses, often of considerable size, form in various parts of the body.

Treatment.—There is no treatment yet known which will prevent or arrest this malignant form of blood-poisoning. It is only possible to adopt measures which make the patients more comfortable, such as cleanliness, and the relief of pain, hunger, thirst, and restlessness.

Whenever a horse is known to be affected with glanders or farcy, it should be killed without the least possible delay, and its carcass should be buried beyond the reach of other animals or men. Its stall, harness, and articles which may have come in contact with the discharges from the ulcers, should be fumigated with burning sulphur and alcohol, or burned when their value is not too great. The laws of most countries are very stringent in their requirements in these respects, and no one who has witnessed the occurrence of this horrible disease in the human subject will hesitate a moment in securing their careful enforcement.

Mumps—Parotitis.

This is among the least infectious of the diseases of this class, many persons escaping it altogether. It is most common among children ; rarely occurs after thirty years of age, and sometimes takes place in grown adults when they are massed together, as in camps, jails, asylums, etc. Males are more often affected than females. The disease consists of a swelling of one or both parotid glands—usually both.

Symptoms.—After two or three days of fretfulness, loss of appetite, and, it may be, some fever, a child has a swelling of the gland on one side, filling up the space behind the lower jaw and in front of the ear. This is accompanied with pain when the mouth is opened, and there is some fever, a coated tongue, and discomfort or pain of the head. The swelling increases in size until the third to the fifth day, the fever having passed off when the swelling becomes well defined. From this time the swelling subsides, and by the tenth to the fourteenth day it has usually passed quite away. In scrofulous children, however, its course is apt to be slower, and its duration, therefore, longer. The flow of saliva is often increased, but there is no such fetid odor of the breath as occurs in excessive flow of saliva from mercurial poisoning or ulceration of the inner surface of the mouth. When the swelling is at its height, there

may be some difficulty in swallowing, though this is not commonly the case, since the swelling pushes outwardly.

A noticeable effect of the swelling of mumps is the pushing outwardly of the lower end of the ear, and the increased breadth of the face at the angle of the lower jaw, giving the face a comical appearance. When the gland is much swollen and hard, it may cause so much pressure on the nerve which passes across it to go to the muscles of the face, that a temporary paralysis of these muscles may be produced.

Two or three days after the disease has made its appearance on one side, the parotid of the other side usually becomes affected and goes through a similar course to the first one.

Matter rarely forms in the swollen gland, but in a few cases the testicles of adult males and the breasts of females become swollen and painful about the time that the disease commences to decline in the parotid, and these organs go through pretty nearly the same course of pain and swelling as the others. It is thought that "taking cold" may have something to do with this complication, but it is quite as likely to be a natural consequence of the disease.

Treatment.—At the outset a laxative, such as a teaspoonful of elixir of *Rhamnus frangula*, or buckthorn, may be of service, but it might as well be omitted unless the head aches or is hot and the tongue is coated.

Cold applications to the throat are not usually of service in limiting the amount or duration of the swelling, and it is thought by some that a resort to this treatment has a tendency to cause the "transfer of the disease," as they say, to the breasts or testicles. Dry and warm applications are usually most comfortable, if their presence does not cause discomfort. Bags of hot bran, or a bat of cotton-wool may be applied to the throat. Food should be given in such form that it can be sucked through the partly closed teeth, and so avoid the pain caused by opening the mouth. Earache is sometimes relieved by these hot applications, or by syringing the ear with water that is 105° Fahr., or a trifle warmer.

If the testicles become swollen, the patient should rest in bed and wear a suspensory bandage or handkerchief so arranged as to support them, and swollen breasts may be similarly treated and enveloped in cotton alone or covered with oiled-silk or gutta-percha tissue.—Ed.]

VACCINATION.

BY

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VACCINATION.

VACCINATION (from *vacca*, a cow) is the practice of communicating to man, or to certain of the lower animals, by inoculation, a disease known as cow-pox, or vaccinia, chiefly for the purpose of preventing small-pox.

During the latter part of the eighteenth century, Edward Jenner, an English physician, became impressed with the importance and probable truth of a tradition, held by dairy-men and others, to the effect that persons who had contracted cow-pox were thereby rendered insusceptible to small-pox. For many years he investigated the subject carefully and systematically, and in 1798 he published his first work upon vaccination, in which he took the ground that the inoculation of the human subject with the virus of cow-pox was a sure preventive of small-pox. The idea was not original with Jenner, for, apart from the traditional belief to which allusion has been made, there is good reason to believe that intentional inoculation with cow-pox had been done before, for the purpose of preventing small-pox; but he cleared up many doubtful points in the matter—showed the necessity of using the virus of true cow-pox only, with which other diseases of cows had before been confounded, and of employing it at a certain period in the course of the disease; and substituted a precise method of inoculation, whereby the unpleasant results which sometimes followed accidental (casual) inoculation were for the most part avoided. In short, he reduced the whole matter to a system, and made its universal employment practicable. To him, therefore, belongs the credit of whatever benefits have resulted from vaccination. The practice was speedily adopted by the whole civilized world, and, except for occasional factious opposition, has ever since held its ground, having wholly supplanted the old practice of small-pox inoculation (variolation).

The disease cow-pox (called "natural" cow-pox in cases in which it occurs without known cause, *i. e.*, in which the source of infection is unknown) is an analogue of small-pox, and is therefore, along with horse-pox, sheep-pox, etc., one of the varioliform

diseases. Many have, indeed, considered it to be but a modified form of small-pox, resulting from the infection of small-pox being communicated to the cow. This theory is supported chiefly by the fact that artificial variolation of the cow (a difficult matter to accomplish) gives rise to a disease which it is difficult, if not impossible, to distinguish from natural cow-pox. Jenner maintained, however, that it originated from horse-pox, by the virus of that disease being inoculated upon the udder by the hands of the milkers, who were often ostlers also. Numerous experiments made in Jenner's time seemed to contradict this view, but it has recently been re-affirmed, chiefly by Depaul,* who has shown the necessity of discriminating between true horse-pox (a general eruptive disease, running a definite course) and "grease" (an affection of the heels of horses)—a distinction which Jenner and other early investigators do not seem to have made. It is certain that artificial inoculation of the cow with matter taken from the "grease" of horses has produced in this animal a disease which we cannot distinguish from true cow-pox. We may therefore conclude that cow-pox may originate from either small-pox or horse-pox, and that perhaps it may occasionally arise independently of either. Concerning the origin of horse-pox, nothing is known. Sheep-pox is a malignant disease, communicable by poisons given off by the animals affected, and which float in the atmosphere, in which respect it, together with small-pox, differs remarkably from cow-pox and horse-pox, which are communicable only by actual inoculation.

Natural cow-pox affects chiefly, if not solely, milch-cows, but is easily communicable to the male animal or to the young of either sex, by artificial inoculation. It is usually a mild disease, and on that account is sometimes overlooked, so that it is doubtless of more frequent occurrence than is generally supposed. It is said that in India it occasionally assumes a malignant character. It is characterized by the formation of pocks on the teats and udder. When fully developed, the pock is a circular, ring-shaped vesicle, varying in size from that of a pea to that of a twenty-five cent piece. The ring-like border is raised somewhat abruptly above the surrounding skin; is of a lustrous, pearly, bluish, rosy appearance, and the centre of the pock is depressed (umbilicated). The vesicular border contains a limpid or slightly straw-colored, viscid fluid (lymph), which is situated in and beneath the epidermis (or outer layer of the skin), in a number of little separate chambers (whence the vesicle is said to be multilocular). The true skin (derma), which forms the "floor" of the pock, is thickened and

* A physician of Paris.

gorged with blood, especially in its papillary layer, so that, on pinching up a pock between the thumb and fingers, it is felt to be seated upon a hard, stiff base, resembling a button, and freely movable upon the deeper parts. Subsequently the clear lymph changes to an opaque, whitish, pasty mass, so that the vesicle loses its lustre, and eventually dries into a reddish brown crust, which, upon falling, leaves, if it has not been interfered with, a reddish, slightly depressed scar, which afterwards becomes white. Various inflammatory complications may be provoked by rough handling or injury of any sort, thus rendering the disease quite troublesome; otherwise it is usually at an end within a fortnight. The general symptoms are usually limited to slight feverishness, which lasts for a few days only, and sometimes is altogether wanting. As a rule, the disease occurs but once in the life of a single individual.

In the human subject the vaccine disease usually pursues the following course: in from *three* to *five days* after vaccination, a small, hard, reddish, pointed elevation of the skin, called a papule, forms at the point of inoculation, accompanied by slight itching. On the *sixth* or *seventh* day this papule is found to have grown to the size of a split-pea, or larger; to have assumed a vesicular (resembling a little blister) appearance at its border, and to have become depressed at its centre. On the *eighth* day (inclusive) the pock, after vaccination with long-humanized virus, has acquired its greatest size; after the use of bovine virus (that is, virus taken from a cow or calf), or humanized virus of few removes, it keeps on growing larger for several days longer. Thus far it has kept the same general appearance as before, the whole pock being situated superficially and movable upon the parts beneath. On the *ninth* day the pock has increased in plumpness, but it is usually more opaque or tallow-like in appearance, a brown incrustation has begun at the centre, and the whole is surrounded by a sharply-defined, bright redness of the skin, in the form of a disk of from one to two inches in radius, called the *areola*. At this time there is generally some fever, lasting for a day or two. The further course of the disease consists in the gradual fading of the areola (beginning at the centre) and the transformation of the entire pock into a hard, dry, translucent, brittle, brown crust, or scab, which falls off some time between the fifteenth and thirty-second days, leaving a somewhat depressed scar, which is usually permanent, and which often shows numerous radiating furrows or lesser depressions (like the pits on a thimble), which latter appearance is termed *foveolation*.

In cases of revaccination, the disease usually runs a more rapid

and less regular course, and in particular, the typical areola is apt to be replaced by an extensively diffused redness.

In the great majority of cases vaccination produces no inconvenience beyond a trifling feverishness and local soreness for a few days, but occasionally certain complications and ulterior effects take place. In persons suffering from certain skin diseases, especially eczema, the latter interfere with the success of vaccination, and are apt to be aggravated by it. They may also be developed by vaccination, in persons predisposed to them. The subjects of certain morbid constitutional taints, such as the scrofulous and the syphilitic, are prone to have their diseased tendencies roused into activity by vaccination. A few diseases, such as syphilis and erysipelas, may actually be conveyed in vaccination. Besides this, the wound of vaccination is liable to become infected by any atmospheric or other contagium which may gain access to it, such as those of erysipelas and diphtheria; but no more so than any other slight wound. Inflammatory complications are somewhat more frequent, affecting the skin, the tissue lying below it, and the lymphatic vessels and glands; but they rarely prove serious. If the pock be injured, an ulcer or open sore is apt to result, but it usually yields promptly to appropriate treatment.

Vaccination is accomplished by inoculating the specific product of the pock—the *virus*, which exists in the lymph contained in the vesicle. To obtain this lymph, which is contained in a number of separate compartments of the pock, the vesicular border should be punctured with a needle (in several places, so as to open a sufficient number of the compartments), at the proper period of the disease—just before the formation of the areola, usually on the eighth day inclusive. Great care should be taken not to draw blood. The lymph exudes in drops, and should be as clear as water, otherwise it is unfit for use. It may be used at once, by transferring it immediately to the person to be vaccinated; or it may be allowed to dry on slips of quill, or ivory, or pieces of glass, or sealed up in capillary glass tubes. The method by immediate transfer (arm-to-arm method) is the surest of success; but it is not always practicable, and moreover it involves most risk of communicating infectious diseases. Dried lymph is the best form of preserved virus. The slips, if carefully preserved, retain their activity for several weeks, as a rule—occasionally for two or three years. They should be kept *perfectly* dry, and in a cool and dark place. Fluid lymph in capillary tubes is apt to become inert very soon, but it sometimes remains active for a long period. Still another form of vaccine virus is the crust or scab which is formed by the drying up of the pock. This form is not to be recommended, for it

is very uncertain in its results, and its use is particularly apt to be followed by inflammatory complications.

If dried lymph be used, it should be moistened with a drop of cold water just before the operation ; the lymph in a capillary tube should be blown out on to a clean piece of glass or porcelain, and when a tube has once been opened, no portion of its contents should be kept for further use ; in using the crust, a sufficient amount of it should be powdered and made into a paste with water. However prepared, the virus should be applied to a *wound* made for the purpose—either a puncture or an abrasion. The latter, which is most to be recommended, is best made by scraping off the outer portion of the skin over a space as large as a pea, taking care not to wound the true skin. A lancet is a convenient instrument, and the manipulation is the same as for erasing ink-marks from paper. After having sufficiently cleared away the dry cuticle to expose a surface of *moist* skin-tissue (no matter whether or not it shows the color of blood), the virus should be applied to the moist surface, and briskly rubbed upon it for a full minute or more. The arm should be kept bare for a few minutes, but no plaster or other dressing need be applied. Everything used in the operation, including the vaccinator's hands, should be scrupulously clean. Inattention to this point is the cause of a great majority of the unpleasant results which sometimes occur.

A child may safely be vaccinated at any age, but, unless demanded by actual exposure, it is well to postpone the proceeding until the age of two or three months, and it is desirable that the child should not be teething or suffering from any disease, particularly disease of the skin. Every person should be revaccinated as often as once in five years, and whenever small-pox prevails. For good reasons, the left arm is usually chosen as the portion of the body to be inoculated. It is well to make two separate inoculations—one at the insertion of the deltoid muscle (see figures on next page), and the other at a point an inch or more distant from the first, over the posterior border of the same muscle. It is sometimes customary in Europe, in the case of females, in order to avoid any appearance of the scar which follows vaccination, to make the inoculation upon the outer surface of the leg. In the case of infants this is probably quite as successful as when the arm is chosen ; but in adults, unless the precaution is taken to remain quiet during the course of the disease, and keep the foot and leg raised to the level of the body, the inflammation and swelling will be greater than when the arm is used.

Of late years, *bovine virus* has been very much used, and presents certain advantages, the chief of which is that it entirely

abolishes the risk of conveying syphilis, provided the following rules are observed: use a *perfectly* clean instrument, and do not apply the same instrument without previous cleaning, or the same quill, or other material charged with vaccine, to more than one person. There are various sorts of bovine virus, viz.: (1) from a case of natural cow-pox (*primary vaccine*); (2) from a variolated

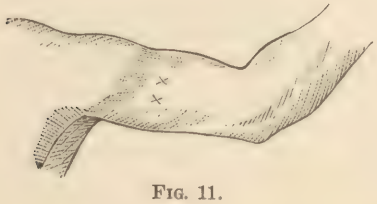

FIG. 11.

FIG. 10.

FIG. 12.

FIGURE 10.—An instrument sometimes employed instead of a knife or lancet, to produce scratches, into which the virus may be rubbed.

FIGURE 11.—Showing the point on the outer surface of the right arm, where vaccination is commonly made.

FIGURE 12.—The crosses show the place on the outer side of the right leg, where vaccination may be made.

cow (*variola vaccine*); (3) from a *retro-vaccinated* cow, *i. e.*, a cow inoculated with humanized vaccine; (4) from an *equinated* cow, *i. e.*, a cow inoculated with horse-pox; and (5) from a cow or calf inoculated with virus which has been propagated through cows or calves from a case of natural cow-pox. The last-mentioned variety is the one generally used, and is to be preferred.

Vaccination almost invariably confers complete protection against small-pox for the time being; but very frequently this immunity becomes impaired or altogether overcome in the course of years, so that the individual finally becomes liable to contract the disease in its modified form (varioloid), or even unmodified. Hence the necessity of revaccination. Small-pox sometimes occurs within a very short time after vaccination. Such an occurrence is usually due to the fact that exposure to small-pox had already taken place before the vaccination—*too long* before for the latter to prove efficient. After exposure to small-pox, vaccination should be resorted to at once, although there is a decided probability that it will suffice if done within three days (inclusive).

After the symptoms of small-pox have once appeared, vaccination is of no use whatever.

The inflammatory complications which sometimes follow vaccination are to be treated as they would be if due to any ordinary cause. Excessive redness, with severe burning and itching, is usually very much alleviated by a weak lotion of carbolic acid, a teaspoonful to a pint of cold water, or the following liniment applied on a couple of folds of soft muslin or linen cloth.

℞.

Stramonium ointment ..... One Troy ounce.
Solution of subacetate of lead..... Thirty drops.
Linseed oil ..... Four fluid ounces.
Mix.

When the articles above mentioned cannot be readily obtained, a teaspoonful of sugar of lead may be added to a pint of cold water, and a double thickness of muslin or linen, wet with it, may be kept on the inflamed spot.

Ulceration of the pock (generally due to injury) may be treated by dusting the ulcerated surface with equal parts of powdered starch and oxide of zinc, and the same may be used to check an immoderate flow of lymph after a pock has been opened for the purpose of obtaining lymph.

Contact with underclothing, and scratching or rubbing, is pretty sure to increase the inflammation and swelling that follow vaccination. They may also cause a rupture of the pock, and, by disturbing the natural course of the disease, produce a troublesome sore. Care is especially needed when flannel underclothing is worn, and it may then be advisable to cover the inflamed part with a piece of soft muslin or linen, greased on its underside with fresh tallow or simple ointment, and fastened sufficiently tight to prevent its slipping about.

In nearly every case in which the arm is the part chosen for inoculation, the lymphatic glands in the arm-pit become more or less swollen and tender. This complication is increased if the limb is much used, and is lessened by keeping the arm quiet. When sufficiently severe to demand attention, a bag of hops wet with hot water and laid in the arm-pit will probably be all the treatment needed in addition to rest.

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CHANCROID AND SYPHILIS.

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CHANCROID AND SYPHILIS.

Chancroid.

A CHANCROID is an ulcer or sore, generally occurring upon the genital organs of either sex, though it is sometimes met with in other parts. It is always the result of contact with matter derived from a similar sore, and usually appears within a few days (three to ten) after exposure. The ulcers are somewhat painful, and freely secrete an abundant and whitish pus or matter, which is highly contagious, and capable of producing a new chancroid, if it comes in contact with a scratch or abrasion of the skin of any part of the body, whether of the person bearing it, or of another. Chancroids vary in number, and from two to five or more are not unfrequently seen upon the same person at the same time. They may vary from the size of a pea to that of a three-cent piece. If untreated, these sores usually persist, under favorable circumstances, for one or two months before healing. If, however, dissipation be indulged in, or the organs which bear them be put to unnecessary use, chancroids usually inflame, become more painful, increase in size and are, naturally, longer in healing. If the patient at the same time be in poor health, they may become "phagedenic," that is to say, the parts surrounding them rapidly mortify, and a considerable portion of the adjoining tissues may be sacrificed.

Bubo.—During the second or third week, or even later, of the existence of a chancroid, a painful swelling in one or both groins may appear. This swelling is called a *bubo*, and may persist for a few weeks, producing a moderate sense of discomfort, and then gradually subside and disappear. On the other hand, it may rapidly increase in size, become exceedingly painful, and matter may form in its interior. The skin over it becomes reddened and thinned, and the bubo, unless opened by the surgeon, ultimately bursts and

discharges a greater or less quantity of pus. It does not, however, immediately heal like a boil or ordinary abscess, but continues to discharge for weeks, and sometimes for months. When the hole finally closes, a very perceptible scar remains. If phagedena attacks the bubo, a great deal of additional damage may be done, and a year or more may elapse before final recovery takes place.

The bubo is the result of the conveyance of the poisonous virus by the lymphatic vessels from the original sore to the neighboring glands. It does not, however, "get into the blood" and infect the system at large, after the manner of syphilis. Consequently, when it is once cured, there is an end of the matter, and the patient is physically as well off as before, except as regards the local injury that may have been inflicted. This is, however, sometimes serious and considerable.

Treatment.—If left to itself, the chancroid will in most cases heal in one or two months, if the patient keeps it scrupulously clean and abstains from spirituous potations, sexual intercourse, etc. If, however, he is negligent in these respects, its duration is indefinite, and he runs the further risks of phagedena and increased liability to bubo. Under careful treatment, the duration of the sore may be very much abridged. The object of treatment is to destroy the virulent character of the ulcer—that is, to change it into a simple sore, with a tendency to heal. This may be accomplished in several ways. First, and most quickly, by the application of a powerful caustic, followed by the use of some simple powder or lotion. The ordinary "caustic" of the shops (nitrate of silver) is not sufficiently active, and is of little use in this connection. Treated actively, chancroids not infrequently heal in a couple of weeks or less, and the chances of bubo occurring are very much lessened.

Secondly, less active, astringent, or stimulating applications may be employed. With these the treatment may be prolonged for a month or more. The first method is decidedly the best, and the only objection to it is the temporary pain produced by the cauterization. This is quite sharp at the moment, but does not last long, and should be borne for the sake of the advantages that attend it. If a bubo appears, it will require applications of tincture of iodine, pressure or poultices, according to circumstances. If matter forms, the bubo must be opened with the knife or the pus be abstracted in some other manner, and when this becomes necessary, the sooner it is done the better.

Under all circumstances, cleanliness and correct living are indispensable to the rapid cure of either chancroid or bubo.

Syphilis.

The diseases of the genital organs, elsewhere described [see Urethritis (See Index) and Chancroid], are of small moment in comparison with the one that now engages our attention. Although painful and inconvenient for the time being, they rarely, except in case of stricture, leave any serious after-effects; and these are confined to the guilty party, and may be considered in the light of a penalty that nature so often exacts of the transgressor. With syphilis, however, the case is widely different, for in many cases, imperfectly treated or neglected at the beginning, the disease harasses the patient for years, and even accompanies him to the grave; and in not a few instances is the direct cause of the fatal event. It may also be conveyed in various ways, as we shall see later, to innocent individuals, and inflict a degree of misery that cannot be easily calculated.

The origin of syphilis is obscure, and its first causes, whatever they may have been, have thus far eluded the most exhaustive researches. The first clear and distinct accounts of the malady date back to the latter part of the fifteenth century, at which time the disease became very prevalent in Southern Europe, from which it rapidly spread over the rest of the continent and the adjacent countries. At the present time it is universally distributed wherever civilized man has gained a foothold. The disease spreads by contagion, and every case (except when hereditary) is the result of direct contact with the syphilitic poison. There are no reasons for believing that it, any more than small-pox, is spontaneously generated at the present time. There are no reasons for believing that it originates simply from dirt, filthy habits, or excessive promiscuous intercourse. These causes may possibly produce the diseases previously described, but syphilis depends on a definite and specific poison, derived from another person, who in turn received it from still another, back to the first case, the origin of which is unknown. The first symptom or sign of syphilis is the chancre.

Chancre.—The chancre, like the chancroid, from which it must be carefully distinguished, usually appears upon the genitals. Unlike the chancroid, it does not appear within the first few days after it has been contracted, but usually delays its advent for two or three weeks, sometimes longer. In the meantime there may be nothing to attract the patient's attention, nothing that the most careful inspection will reveal, that will lead the patient to suspect or enable the surgeon to declare that syphilis has been contracted. This period of latency, or of "incubation," as it is called, is finally

terminated by the appearance of a small reddish-brown pimple, which, if taken between the fingers, is found to be a little firmer than the natural tissues of the part. In a few days this pimple increases in size, and usually ulcerates a little and looks something like a small chancroid, except that it does not secrete as much matter as the latter; that is to say, it is dryer. It will be found to offer a good deal of resistance to pressure between the fingers, due to a hardened layer, called the "induration," which forms at its base. This induration differs in degree in different cases, sometimes being very slight, at other times exceedingly distinct. The chancre is rarely painful, and usually does not attain any great size, and in some cases causes so little inconvenience as to escape notice altogether, by those who are not on the lookout for trouble. Not unfrequently men who have taken risks will make a rigid daily inspection for a week or so, and if they fail to discover anything wrong by this time, consider themselves safe, and give the matter no further attention. They are consequently surprised a week or two later by the appearance of the chancre. If, in the interval between the contraction and the appearance of the sore, they have had intercourse with several women, they usually charge the difficulty to the account of the wrong person. If, as sometimes happens, the chancre appears and disappears without having attracted the notice of the patient, he is still more surprised when the surgeon informs him that some eruption on the skin, or other trouble for which he seeks advice, is syphilitic, and will declare most vehemently that he has never had a chancre, and therefore cannot understand how such can be the case. Usually a chancroid is much more annoying to the patient, and much more likely to attract his attention and alarm him than a chancre.

Although, as a rule, the chancroid and the chancre present quite different appearances, it sometimes happens that the characteristic aspect is absent, and it becomes difficult to distinguish one from the other. In some cases the most experienced surgeons are unable to decide positively whether a certain sore is a chancroid, or, consequently, a local disease not followed by a constitutional infection, or whether it is really a true chancre, to be inevitably succeeded by the secondary stage of syphilis. Chancres, unlike chancroids, usually come singly or, at the most, but two or three. If a patient have two or more sores at the same time, one of them may be a chancre, and the other a chancroid, which have been contracted at the same or at different times.

The usual duration of the chancre, when untreated, is from one to two months. After it has existed for a week or ten days, the patient will generally find that he has some enlarged glands or

kernels in the groins; these may attain the size of a hazel-nut, or even of a pigeon's egg, but are rarely painful, and almost never inflame and suppurate like the bubo that follows chancroid. At the same time other glands in the body enlarge and become hard, but as a rule their presence is first discovered by the surgeon.

Although often quite innocent in appearance, the chancre is very contagious, and is the most frequent, though not the only, medium by which syphilis is transferred from one person to another.

From one to two, rarely as late as three, months after the appearance of the chancre, a new set of symptoms arise. These mark the beginning of the secondary period of the disease, or constitutional syphilis, as it is often called.

Secondary Syphilis.—This does not always commence in the same way. In the majority of cases the first thing that attracts attention is the appearance of a number of small red spots upon the skin; these last for a few weeks and disappear, to be followed by a distinct eruption of pimples scattered over the surface. These, as well as the little red spots which first appeared, usually respect the face, and confine themselves to the covered portions of the body. After a time these also disappear, without leaving any scar or mark other than a slight stain that in time fades away. Later, however, quite large pimples, called "tubercles," appear, which may remain as such, or change into pustules, and become covered with crusts and scabs. At this time the face and scalp usually come in for their share of the disease, which is now apparent to every observer. These tubercles and pustules always leave little scars or "pits" in the skin, something like those of small-pox. Still later, large pustules and ulcerations form, and, if numerous, render the patient a disgusting object to all with whom he comes in contact.

The skin, however, is not the only part of the body that suffers in secondary syphilis. About the time that the first eruption appears, the mouth and throat are liable to become sore. The throat becomes inflamed, the tonsils swollen, and ulcers appear on them and on the palate. These extend and destroy the parts to a greater or less extent. At the same time small, slightly raised whitish spots, called "mucous patches," may appear on the lips, tongue or other mucous membrane. These give rise to a secretion which is fully as contagious as that of the chancre, and are not infrequently the source of infection, through the medium of pipes, drinking vessels, and kisses. The person thus innocently infected contracts a chancre at the point where the infection is received, namely, on the lips, tongue, or inside of the mouth.

In women mucous patches frequently occur upon the genital organs also, and thus prove a source of infection fully as dangerous as the chancre.

The eyes also are liable to suffer, usually in a painful manner, and if neglected, impairment of vision usually results. Still, other parts of the body may become affected during the early and middle periods of the disease.

During the whole of the secondary period, the patient's general health is apt to deteriorate, and after a time he becomes subject to various pains, specially noticeable in connection with the long bones, as those of the arms, legs, and breast-bone, and not confined to the joints, like ordinary rheumatism. These pains are most severe at night, and interfere greatly with the sleep, and consequently with the comfort and health of the sufferer. At daylight, however, they subside or disappear entirely, to recur on the following night, and so on indefinitely. Coincident with them, painful lumps, called "nodes," may appear on the shins and elsewhere. These various symptoms do not last forever, but after a time disappear, and may be followed by a varied interval (perhaps months, perhaps years) of comparative comfort, when, without apparent cause, symptoms pertaining to what is termed the tertiary period, supervene.

Tertiary Syphilis.—After the disease has spent a portion of its energy on the more external parts of the body, it not infrequently attacks the deeper regions. The cartilages of the nose, and the bones, especially of the palate, nose and skull, are apt to suffer; they become "carious," that is, rotten, and come away in small pieces, and their loss results in more or less disfigurement of the features. The vital organs, such as the liver and kidneys, are also liable to be invaded by the disease, and, still later, the spinal cord and brain. If any of these organs are affected, the disease may prove slowly or rapidly fatal.

Such is the picture that neglected or mistreated syphilis not unfrequently presents to the surgeon's eye. The description is not overdrawn, for, while some patients may escape most of the troubles enumerated, others may suffer from them all and more.

Hereditary Syphilis.—During the early periods of the disease, that is, during the existence of the chancre or of mucous patches, a man may convey the disease to his wife, and if she become *enceinte* after she has contracted the disease, her offspring, if she has any, are liable to be affected. Nature, fortunately, limits the number of such offspring by miscarriage, or premature delivery; or if, by chance, a few are born alive, they usually succumb within a few

months. Sometimes they pass through childhood and reach adult life, but they are apt to suffer much and variously on the way.

It is probable that even in later periods of the disease a man may beget syphilitic children. In tertiary syphilis, however, the infection of wife or offspring is believed, by most authorities, to be impossible.

Treatment.—Judicious treatment of syphilis fortunately robs this disease of most of its terrors, as many cases are undoubtedly cured permanently, while in many others the amount of inconvenience produced by the disease is reduced to a minimum. The treatment, however, is tedious, and, to secure the best results, requires the active co-operation of the patient. The physician may prescribe, but if his directions are not strictly followed, the patient can hardly expect the benefit that would otherwise accrue.

One of the first points to be attended to is general hygiene. Good health, good food, good air, suitable clothing, freedom from undue exposure to the elements, regular exercise and methodical habits, constitute more than one-half of the treatment. *Per contra*, the absence of these essential elements will greatly impair the effects of the best of treatment, and not unfrequently lead to relapses, annoying alike to the physician and the patient. Temperance is a *sine quâ non* of successful treatment, and if reformation in this respect is necessary, the patient must fairly make up his mind to undergo the requisite self-denial.

The period required for successful and radical treatment will vary from one and a half to two and a half years, during the whole of which time the patient should be under the immediate supervision of his physician. He must fully understand at the beginning that he has gotten himself into very serious trouble, and that it will take time and faithful attention on his own part to secure him immunity from suffering in after years. In other words, if the case is taken in hand at the beginning, and treatment is carefully followed up for the period named, the probabilities are strong that the patient will suffer but little from his disease during the period named, and not at all during the rest of his life. This is a much more cheerful prospect than would have been offered thirty or even twenty years ago, for at that time the idea was prevalent, both with the public and with the profession, that syphilis was not permanently curable. At the present day, however, the experience of the author and that of most surgeons who see much of the disease, warrants the statement that a considerable proportion of cases are permanently and radically curable. There is but one drug, however, that can be relied upon to accomplish this end. This drug is mercury. There is a very prev-

alent notion that mercury, although capable of relieving the disease, is apt to accumulate in the system and produce diseases or give rise to discomforts greater than those which pertain to syphilis itself. This idea was justified to a great extent by the results that followed mercurial treatment in former times. The facts are these: If a dose of a suitable preparation of mercury is taken, it is immediately absorbed into the blood and circulates throughout the body. In a few hours, however, it begins to escape from the blood through the kidneys and may be found in the urine. If now the daily dose be greater than the kidneys and other excretory organs can daily remove, the drug will naturally accumulate in the system, and its presence there in undue quantity is harmful. On the other hand, if the dose is not larger than the kidneys are capable of removing, the drug simply acts its part in neutralizing and eradicating the disease, and passes out of the body without leaving behind any undesirable consequences. The practice of the best surgeons at the present day is to give mercury for long periods, months at a time, with brief or even with no intermissions, but to give it in extremely small doses. Formerly, it was thought necessary, to salivate. At present, salivation is considered not only unnecessary but harmful. It is a misfortune that must be sedulously guarded against. The patient's own watchfulness must serve him here. Having received from his physician a prescription for mercury in pills or in a mixture, as the case may be, with directions as to dose, his first duty is to follow absolutely the directions given. If, after he has taken the medicine for a few days or weeks, however, he finds that his gums are becoming painful or his teeth sore, salivation is imminent and the medicine must be immediately discontinued, and not resumed until the patient is able to consult his physician and receive further advice in the matter. It is not always possible to determine, in the beginning, the proper dose that each patient should receive, as the disease differs in severity in different cases, and the patients themselves differ in their susceptibility to the action of the medicine. Salivation, therefore, is rarely the fault of the physician, but is more frequently due to lack of care and watchfulness on the part of the patient. After complete recovery from the salivation, if it should occur, the mercury is resumed as long as may, in the judgment of the physician, seem proper. It is probable that it will be necessary to continue its use for a considerable period. If this course were strictly followed there would be fewer cases presenting the severe symptoms we have already described.

Many patients, however, fail to comprehend the real gravity of their position, and discontinue all treatment as soon as the symp-

toms for which they have sought advice have disappeared. They seem to imagine that when the eruption has faded that the disease itself is cured, and that the necessity for further medication no longer exists. A few weeks or months later a relapse awakens them from their fancied security, and they return to their physician complaining that his treatment has failed to cure them. Quite as often they consult a different physician and abuse the last one for not having done that which was simply impossible. A few weeks' treatment again relieves them temporarily, and with the disappearance of their trouble they discontinue medication. Another relapse occurs in due time, and the folly of submitting to but a short course of treatment is repeated until at last the general health becomes seriously impaired and perhaps wrecked for life. The proper course is for the patient to carefully select in the beginning the physician to whom he entrusts his case, and to stick to him continuously until he is told that he requires no further supervision. Under ordinary circumstances entire suspension of treatment is not prudent in less time than eighteen months or two years. If, during this period, he is under judicious treatment, and if he, at the same time, takes proper care of himself, he is not likely to suffer any particular inconvenience from his disease except the nuisance of continual medication. This, unfortunately, cannot be helped, but must be borne with as much resignation and philosophy as the patient is able to command.

The relations of the patient to himself and to his physician are not, however, the only ones that are to be considered. In contracting syphilis he, at the same time, acquires a grave responsibility that no honorable man would think of shirking. It becomes the duty of the syphilitic to use every means to prevent others from innocently acquiring the disease from him. During the first few months of the disease, while there are sores upon the genitals or about the mouth, the disease is actively contagious, and intimate association with another is likely to result in infection. This part of the subject is too important to permit us to veil our meaning by the use of delicate phraseology, and we shall therefore distinctly detail, in plain words, the matters we think it necessary that the patient and others should be acquainted with. There are those who think lightly of their intercourse with public women, and who, having contracted the disease, do not hesitate to keep up their promiscuous habits. They are, of course, aware that they may, by so doing, infect some other woman, but this does not restrain them. With a feeling, perhaps, of general enmity against the mercenary portion of the sex, they sow wide-cast the seeds of disease. Each one thus infected may in turn distribute the malady

to a score of fresh victims. The State Prison is the proper place for a man who would thus knowingly and wilfully expose so many of his kind to the risk of infection. Every proper-minded man, therefore, will abstain absolutely from cohabitation as long as there is any danger of conveying the disease. This, however, is not the only precaution that must be taken. The syphilitic may, by chance, have a *fiancée*, or a sister or a mother. The habitual and proper caresses that are customary in the family circle must be abstained from. More than one sister, more than one mother have received infection through the kiss of a brother or of a son. These innocent ones must be protected at all hazards. As regards the *fiancée*, there is not the slightest doubt in the writer's mind as to the proper course to be pursued. The marriage engagement should be broken, and the sooner the better, and not renewed except under the advice of a competent physician.

There is still another source of infection that must be borne in mind. The disease may be transferred from one to another through the medium of a pipe or a drinking vessel. This may curb sociality a little, perhaps, but it must necessarily be submitted to.

Syphilis may also be conveyed from a syphilitic infant to its wet-nurse, and *vice versâ* from a diseased wet-nurse to her nursling.

The position of a married man who contracts the disease is particularly trying. Cohabitation and marital caresses must of course cease upon the first appearance of disease, and should not be renewed until the patient's physician assures him that danger of infection no longer exists. The unhappy results which follow a disregard of those precautions are familiar to every physician in metropolitan practice. During the past year, two striking instances have fallen under the observation of the writer. In the first case, the husband, having contracted the disease, gave it to his wife, and within a few months their three children, from three to eight years of age, became infected. Subsequently two intimate friends of the family were numbered among the victims. In the second case, the husband, then the wife, and afterwards five out of seven children contracted the disease, all within a little more than a half year. We need not dwell further upon this point, but pass to another concerning which the syphilitic often desires very particular information. This is the question of marriage.

When may syphilitics marry? This is a question that cannot be hastily answered. Before attempting a reply, we will glance at some of the facts and circumstances that demand consideration in this connection. During the primary stage (existence of the chancre) marriage would almost inevitably be followed by infec-

tion of the wife. During the period of the secondary lesions (sore mouth, eruptions on the skin, etc.) infection is somewhat less certain, but still exceedingly probable. During either of these periods, if conception should occur, infection of the unborn child would probably result, and, as a consequence of this, either miscarriage during the early months of pregnancy, or, if gestation goes on to its full term, the birth of a feeble infant, which usually perishes in a few weeks or months, with distinct manifestations of the inherited disease. Sometimes the child survives, but only to pass through a few years of life with more or less suffering. Fortunately the second child of syphilitic parents is less likely to suffer severely than the first, and after a time the syphilitic tendency in the offspring seems to diminish, so that, subsequently, children may be comparatively healthy. Surely, no one with this prospect before him would think of marrying during the active stages of the disease.

In the tertiary stage, the tendency to the infection of the wife or offspring is very greatly lessened, and perhaps does not exist at all. If, through neglect or bad treatment, the general health is seriously impaired, no prudent man would think of marrying, even were syphilis out of the question. It often happens, however, that patients may suffer from some of the late symptoms of syphilis, and still enjoy fair and even apparently robust health. May persons thus situated prudently marry? It being granted that the chances of direct infection of wife or child are reduced to a minimum, it is by no means certain that the offspring will enjoy the same average health as children whose parents have not suffered from the disease. There is a prevalent notion, both in and out of the profession, that many of the diseased conditions, termed "scrofulous," are the result of syphilis in the parent or grandparent. The amount of truth involved in this idea is not readily estimated. Certain it is, that in the majority of scrofulous cases no satisfactory evidence can be obtained of parental syphilis. On the other hand, many cases called scrofulous, are really examples of hereditary syphilis. While, therefore, it cannot be asserted that there is any great probability of the transmission of syphilis by persons marrying during the existence of symptoms of tertiary disease, it is certainly the part of prudence to refrain from any step that may seriously impair the health and well-being of prospective offspring.

When, then, may the person who has been so unfortunate as to contract the disease, prudently enter the marriage relation? In the majority of cases that have been judiciously treated in the beginning, the disease will run through its course and spend its

force within a period of two years, after which a long and frequently perpetual immunity from the disease is enjoyed. In other words, the disease has, to all intents and purposes, been radically cured. Of course, when this is the case, there can be no earthly objection to marrying. The only question to consider is, whether in a given case the disease has actually spent its force. As a general rule, it may be stated that if at least two years have elapsed since the last manifestations of the disease, the probabilities of a relapse are slight, and if they should occur, will not be of a nature to specifically impair the health of wife or offspring. Many instances are known to the writer, and in fact to every surgeon, where men who had been syphilitic, have subsequently married, without detriment to their wives and children. It is not, however, safe to rely upon any general rule in this matter. Each case should be considered by itself, and the only prudent course for one contemplating matrimony under these circumstances, is to seek competent professional advice.

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The Skin and Hair:

THEIR CARE AND DISEASES.

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THE SKIN AND HAIR.

STRUCTURE OF THE SKIN.

THE skin is composed of two layers: the upper—the cuticle, epidermis, or scarf-skin; the lower—the true skin, *cutis vera*, or corium. The cuticle is thin, and consists of cells which in its lowest part are soft and round, in the upper layers are flat, dry, and horn-like, and serve to protect the more sensitive and delicate structures beneath. The cuticle is easily removed by violence, and becomes white and softened (parboiled) when immersed for a considerable time in water. It is constantly renewed beneath by the development of new cells from the upper surface of the true skin, as its outer layers are imperceptibly cast off. The true skin has a thickness of ½ to 1½ lines, and a complex structure. It is made up in great part of bundles of firm and elastic fibrous tissue running in various directions, and it is this substance which gives to it, when converted into leather, its elasticity and durability. Its upper surface is thrown up into

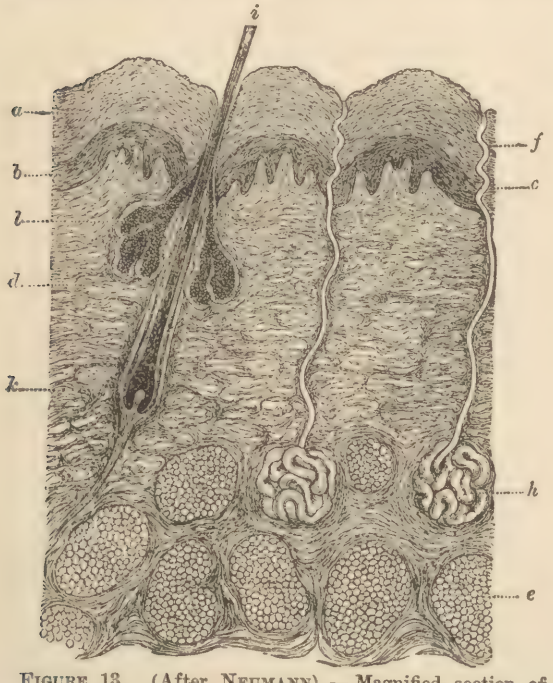

FIGURE 13. (After NEUMANN). — Magnified section of healthy human skin: *a*. The horny layer of the cuticle, scarf skin, or epidermis. *b*. The Malpighian or mucous layer of the epidermis. *c*. The papillæ developed on the surface of the corium, or true skin. *d*. The true skin. *e*. Collections of fat-cells underlying the true skin. *f*. The duct or canal of a sweat-gland. *h*. The convoluted portion of a sweat-gland lying below the true skin. *i*. The shaft of a fine hair. *k*. Root of the hair. *l*. A sebaceous gland emptying into the hair follicle.

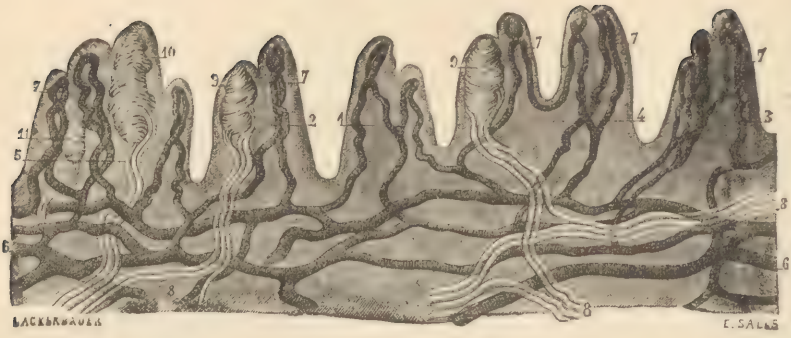

FIGURE 14. (After SAPPEY).—The papillæ of the true skin, showing the terminations of nerves and loops of capillary blood-vessels.

minute conical elevations, called papillæ, which project for some distance into the cuticle, and contribute to the irregularities of the exterior of the skin (see Fig. 13). Some of these papillæ contain networks of small blood-vessels; others the terminations of nerves, and are, therefore, the organs of touch and sensibility. It is traversed in all its parts by an abundant system of capillary blood-vessels, which accounts for the free escape of blood when the skin is pricked or cut; and it contains also channels and vessels for the flow of lymph (see Fig. 14).

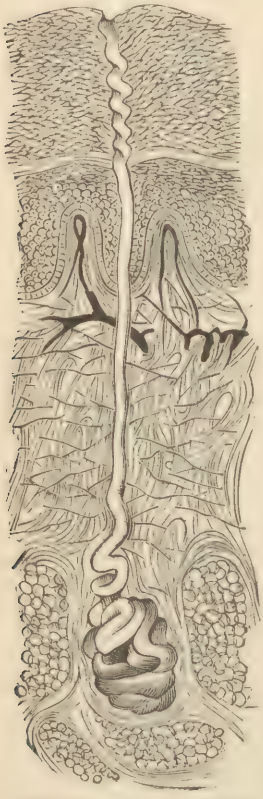

FIGURE 15. — A sweat-gland.

The skin possesses, moreover, two sets of secreting organs — the sweat and the sebaceous glands. The sweat-gland consists of a tube which runs from the openings or pores upon the surface of the cuticle perpendicularly downward to the lowest portion of the true skin, or the loose fatty tissue which lies beneath, where it is coiled upon itself in many convolutions (see Fig. 15). Being closely surrounded by a network of blood-vessels, the gland is able to take from the blood its watery elements with great rapidity, and to pour out the perspiration upon the surface of the body very copiously. The number of these glands is very great, and they are distributed over the whole surface; indeed, it has

been estimated that it is as high as seven millions, and that the whole system of tubes amounts to twenty-eight miles in length. Through them a quart of sweat, consisting chiefly of water with a little common salt in solution, may be daily poured over the external surface in the form of insensible perspiration.

The sebaceous glands are sacs, either simple or composed of several lobules, and are situated in the middle or upper portions of the true skin (see Fig. 13). They lie mostly by the side of the hair-follicles, and discharge their secretion into the upper part of the latter; or, where the hairs are small—the lanugo hairs—this

FIGURE 16. (After NEUMANN).—Mode in which the soft (lanugo) hairs pass through the canals of sebaceous glands.

arrangement is reversed, the glands emptying directly upon the surface of the skin, while the lanugo follicles open into the neck of the gland (see Fig. 16). They contain an oily material, produced by fatty degeneration of the cells which line and fill the sacs, and this substance, absorbed by the hair and spread over the surface of the skin, serves to keep both properly soft and moist. It is this material which in excess covers the skin of the newly-born infant. These glands occur in great numbers over the whole body, excepting the palms and soles.

The skin is also supplied with a fine network of muscular tissue and other muscles which run obliquely downward from the under surface of the cuticle, and are inserted into the base of the hair-follicles (see Fig. 17). Their contraction serves to erect the hairs, and to produce the condition of the surface called goose-flesh. Their functions in man may be looked upon as nearly obsolete, but in some of the lower animals they play an important part in the movements of the skin and hair.

The color of the skin is caused by the presence of a dark pigment in the lowest layers of cells of the epidermis, and its variations in the different races of mankind and in various parts of the body depend wholly upon the relative number of these pigment-cells, the underlying true skin of the blackest Africans being of the same color as that of the fairest whites (see Fig. 18). The structure of the hairs will be described farther on, in the section devoted to their diseases.

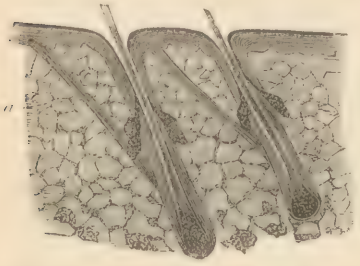

FIGURE 17. (After SHARPEY and QUAIN).—*a*. One of the muscles which cause the hairs to become erect.

Thus, it will be seen, the skin is far from being a simple, uniform structure, designed as a mere covering for the tissues beneath; it is also a highly complex series of organs, and its functions are of great importance in the general economy of life. These can be merely alluded to, however, in this connection. The action of the sweat-glands is largely concerned in the regulation of the temperature. There is also a close relationship between their action and that of the blood-vessels and kidneys, inasmuch as they remove a large part of the surplus water from the body when stimulated into over-activity by external heat or unusual muscular exertion; whereas, when they are inactive through surface chill or disease, the kidneys are called upon to do a relative excess of this work. The skin, too, is one of the great organs of sensation, as nearly all our impressions derived from the sense of touch, and our appreciation of temperature, are received through it. Its sensibility is most acute at the most salient points of the body—the fingers, for instance. Moreover, it possesses certain properties of absorption, which are availed of in the treatment of disease.

FIGURE 18. (After KÖLLIKER). —*a*. Papillæ of the true skin. *b*. Deep layer of cells containing the pigment which gives to the skin its color. *c*. Mucous layer. *d*. Cuticle or epidermis.

THE CARE OF THE SKIN.

The skin requires frequent washing. It is not only exposed to contact with the dust and dirt of its external surroundings, but has deposited upon its surface constantly a large amount of perspiration, which on evaporation leaves a residue of salty matter mixed with the fatty secretions of the sebaceous glands. The worn-off cells of the cuticle, too, which should be always falling imperceptibly, are sometimes retained as accumulations of dead matter upon its surface, and in some parts, as between the toes, readily undergo decomposition and give rise to ill-smelling products. The odors also connected with the glands in certain regions, the arm-pits, genitals, etc., are very offensive, and become noticeable if not frequently removed. It is evident, therefore, that the skin needs frequent washing. It is also true that persons engaged in dirty occupations, those living much in the dust of the open air, those whose cutaneous secretions are naturally abundant, those in whom the process of casting off the dead cells is sluggish, require more frequent washings than others, so that no positive rule can be given as to the care of the skin in this respect applicable to all persons alike. Naturally those parts of the body most exposed to the air, and those where the glands of the skin are most active, need the greatest care. So far as the health of the skin is concerned, there is no doubt that it may be maintained generally even when the laws of cleanliness are grossly and persistently violated, although some of its affections are either caused or aggravated by want of proper attention in this respect.

Infants should be bathed daily. Fresh sweet oil or lard should first be thoroughly rubbed into any parts where there is a tendency to the collection of scales or sebaceous matter, then a little white toilet soap upon a wet sponge should be rubbed in until well mixed with the oil, after which both are to be washed off with an abundance of water. The scalp is especially to be kept clear in this way of the sebaceous crusts which are so often allowed to form upon it. After the bath, finely powdered starch may be applied to any parts which are chafed, or between the folds of the joints. In childhood the daily bath may be continued with advantage, care being taken that the temperature is never excessive, or, with children of feeble vitality, too low. If there is a want of reaction in the skin after proper drying and friction, the full bath should not be allowed. It cannot be said that for purposes of cleanliness the immersion bath is necessary either for children or adults, the sponge-bath, or even the wet towel, when better means cannot be

obtained, being all-sufficient. Neither can it be said that a washing of the whole surface of the body every day is absolutely necessary to this end, although some parts should be daily washed. It is very rare, however, that any harm comes of frequent bathing, if performed at proper times.

Some parts of the skin require the use of soap. There is an inexplicable prejudice among the most intelligent classes of society against its use upon the face. There is no part which requires it so much, for not only are the cutaneous glands here most developed and active, but their openings collect and retain the dust to which no other part of the body is so much exposed. The neglect of its proper use is a frequent cause of what is called a "bad complexion." It will be ordinarily sufficient if a little soap is rubbed up in the water with which the face is daily washed, and fresh water may be subsequently used if there is any fear of its producing a "shiny" look. This appearance is generally due to a disorder of the sebaceous glands, which might have been prevented, or may be relieved, by a proper use of soap. The mistake, too, is often made, by girls and women especially, of not rubbing the face sufficiently after washing. A thorough friction with a not oversmooth towel is often of advantage in removing effete epidermal matter and stimulating a sluggish skin. In old persons the functions of the skin are often tardily performed, and collections of sebaceous and dead scaly matter tend to form upon the face and scalp, which may be prevented by the use of soap.

In selecting soaps for the toilet, those which are white and mostly free from scents should be chosen, for impure materials in their manufacture may be easily disguised by strong odors and colors. There is no positive virtue in castile soap, as is so generally supposed, nor in carbolic, tar, or other medicated soaps for ordinary purposes; the simpler the soap the better.

Hard soaps are made by the combination of animal and vegetable fats with caustic soda; soft soaps by their chemical union (saponification) with caustic potash. They both owe their detergent or cleansing properties to the action of the alkalies thus modified upon foreign matters upon the skin and its effete epidermal cells. Soft soaps are too active in the latter respect for general toilet purposes.

THE NATURE AND CAUSES OF SKIN DISEASES.

With such great complexity of structure and variety in its functions, it is not surprising, considering the proneness of the human body to disease, that the tissues of the skin should also

undergo changes, and that its organs should become disordered; indeed, diseases of the skin are very common and very multiple in character. These diseases are manifested by alterations in all parts of its own structure and in those of its various systems of vessels, nerves, and glands; by a great variety of surface changes; and by modifications in its sensations, color, temperature, dimensions, etc. So diverse, in fact, are the appearances of the skin under the action of disease, that the different forms of tissue-change (called collectively *eruptions, efflorescences, rashes, humors*), have been subdivided into groups, which have received distinct names. Thus, simple spots not elevated above the general surface are called *maculæ;* small elevations are called *papules;* larger ones, *tubercles* or *nodules;* still larger protuberances or swellings, *tumors;* little elevations containing a clear fluid, *vesicles* or *blisters;* those of a larger size, *blebs* or *bladders;* those which contain pus or "matter," *pustules;* large, flat, evanescent elevations, whiter than the surrounding skin, as those produced by the bites of fleas and mosquitoes, *wheals.* When the tips of any of these are scratched off, or the healthy cuticle is torn up, laying bare the true skin, the wound is called an *excoriation;* deeper cracks penetrating the skin are *fissures;* larger losses of tissue extending down below the papillary layer of the cutis, generally the result of preceding disease of the part, are *ulcers;* the fluids which ooze from an ulcerating or excoriated surface, either serum, blood, or pus, dry into firm, protective coverings, *scabs* or *crusts.* The hard, white tissue which follows deep injury, or destruction of the skin through violence or disease, is a *cicatrix* or *scar.* The dry, flat collections of epidermal cells upon the surface of the skin are *scales.*

These are the most important forms of eruption which the skin presents in disease, and they represent, or are the expression of, a great variety of so-called pathological changes in its tissues. Some affections are characterized by a single form of eruption throughout their whole existence, while in others the eruption is constantly changing, one form being converted into another, as the papule into a vesicle, and this into a pustule, in their different stages, or many kinds of efflorescence may present themselves at the beginning. It is in this way that so few forms of eruption as those above enumerated are capable of forming the great variety of combinations of appearances which characterize the very numerous distinct diseases of the skin. But as these eruptions individually do not always represent one and the same pathological condition of the tissues, or, in other words, may be wholly unlike in nature and cause, we are unable to judge of the character and

relations of skin diseases by the mere form of the efflorescences they exhibit. We are obliged, therefore, to consider the nature of the tissue-changes represented by these eruptions in determining the true character of cutaneous affections. It is on this basis that we shall arrange the diseases that we are about to consider, placing together those which are most alike in their real nature instead of in mere outward appearance. Such an arrangement is called a *classification.* Nine such groups or classes may be recognized of practical value, as laid down by Professor Hebra, the distinguished dermatologist of Vienna. They are: 1. Disorders of the glands. 2. Inflammations. 3. Hæmorrhages. 4. Hypertrophies or overgrowths. 5. Atrophies or wasting of tissues. 6. Ulcerations. 7. New growths. 8. Nervous affections. 9. Affections caused by animal or vegetable parasites.

Many erroneous opinions are held concerning the causes of diseases of the skin, far more than with regard to those of any other tissues or organs of the body. It has been popularly believed that the skin in some way serves as a mirror to reflect visibly upon its surface the disorders of the internal economy, and that "humors" and other vices of the blood work their way outward through the skin, and there express themselves in the form of various eruptions. The skin has thus lost its individual character in its relation to disease, and has come to be held merely as a sort of index of the internal system, and the immediate conclusion of most persons with any affection of the skin is that the "blood must be out of order," or that they have scrofula, or "a humor." What this last word means nobody knows, so that it may be regarded as something which does not exist; but, so far as concerns the relation of the skin to the blood, it may be stated that it is an intimate one, as the blood flows freely through it—but no more intimate than that of the blood with most other structures of the body, and that, so far as can be shown, the condition of the blood has no more to do with the causation of skin diseases than of those of any other part of the economy. The fact is, that the skin is of itself a great series of complex organs, with just the same inherent tendencies to disease, and just the same right to its independent affections as the tissues of any other organ—the lungs, liver, or kidneys, for instance. By this it is not intended to deny that it is not a part of, and closely connected with, the general economy, and that it sympathizes with the general condition of the body in disease, only no more so necessarily than any other of its separate parts. Skin diseases, therefore, are in no way to be regarded as peculiar, or as indicating ordinarily any vice of the general system. We can sometimes recognize their direct causes, which may

be either external or internal in nature, but in the great majority of cases we know nothing of their origin, in which respect, too, they are like many diseases of other parts of the body. Among the external causes are all agents which exercise an injurious influence upon it from without, either mechanically, chemically, or otherwise, as undue pressure, scratching, extremes of temperature, strong acids or alkalies, poisons, irritants, etc., and the vegetable and animal parasites. Among the few internal determining agencies, more or less powerful, that we have any positive knowledge of, are family predisposition, age, and diet. Some temperaments are especially prone to certain forms of affection; some families show themselves particularly liable to certain diseases, which may be traced through many generations; infancy, mature life, old age, have each their peculiar forms of disease; while certain articles of food and medicine are capable of exciting directly a diseased action in the skin.

A word may here be said about some errors which prevail widely as to the part which some kinds of food play in the production of these affections. It is almost universally believed, for example, that fats or greasy articles are the direct cause of "pimples" (*acne*) and other eruptions upon the face. That rich dishes like pastry, gravies, etc., may give rise to indigestion, and by disturbing the general relations of the economy, aggravate and in rare cases possibly create a local disorder of the skin, is undoubtedly true, but this is because the fat has been chemically altered by cooking. On the other hand, it may be stated that there is no reason to believe that simple fats, as cream, milk, butter, cheese, oils, or the fatty parts of boiled, roasted, or broiled meats, exercise the slightest injurious effect upon the skin, either in health or disease. Here, too, it should be added that, beyond question, certain mental conditions, grave bodily disorders of one or another kind, insufficient diet, and miserable modes of life may conduce to the causation of skin diseases by lowering the vitality of the general system, and thus also of the skin.

No place could be fitter than here, in connection with these remarks upon the nature and causes of skin diseases, to allude to another widespread error: the belief, namely, in the danger of curing them. It arose, no doubt, from the theory above mentioned, that they are the expression or striking-out upon the surface of some internal "humor," whence has come the common expression of fear lest the eruption be made to "strike in," or be "driven in" to some vital organ. The statement that these eruptions are, in the vast majority of cases, but the skin's way of showing its own independent diseases, should dispel such fears; but it

may be more positively stated that these eruptions cannot be driven to any other part of the economy, and that no harm can possibly come from the disappearance or cure of any form of efflorescence or skin disease. That physicians sometimes make statements which confirm such fears of the patient or family is true, but the only explanation of such advice is ignorance, or the desire to avoid the care of cases difficult to manage. There is no more reason why we should not endeavor to cure any and every disease of the skin than of any other organ of the body, and no more danger is to be feared from our results if successful. The combined evidence of all dermatologists of high standing upon this point is the same.

Although, as a rule, seldom fatal, diseases of the skin are among the most annoying affections which afflict us, partly from the great disfigurement to which they so often give rise while present, and the scars and stains which may remain as more or less permanent marks of their past existence, as well as from the intense suffering in the form of itching and other sensations to which they so generally give rise.

THE DISEASES OF THE SKIN.

Class I.—Disorders of the Cutaneous Glands.

A.—*Disturbances of the Sebaceous Glands.*

The sebaceous glands, it will be remembered (see page 145), secrete a colorless, oily fluid, which is poured out upon the surface of the skin, through the openings of the hair-follicles, for the purpose of keeping the cuticle and hair in a smooth, soft state. This secretion, the *sebum*, may be changed in quantity, in character, or be prevented from escaping from the follicles; and these conditions constitute the affections of these glands.

I. CHANGES IN QUANTITY.

Excessive Secretion of Sebum.

When the sebum is secreted in excess it gives a greasy, shining look to the surface of the skin, or the oily matter may be seen standing in little transparent and colorless beads at the mouths of the glands. This last condition is most frequently observed upon the nose. It may be distinguished from perspiration, which it

closely resembles, by its greasing paper, and by its constant occurrence even when the face or body are not at all overheated. It is noticed in young people mostly, and is generally associated with other disturbances of these glands. The more general greasiness of the skin affects the forehead, nose, and cheeks, and is most frequently accompanied by distended, plugged, and inflamed sebaceous glands. Excessive secretion of sebum to a less degree is often a more universal condition of the surface, and is noticed not so much by any oily appearance of the skin as by the staining of clothing worn next to it, especially by the greasing of the pillow or other bodies in frequent contact with the scalp.

The treatment for excessive secretion consists chiefly in the frequent use of the means best adapted to its removal. These are the soaps, and in this connection it may be stated that these affections are most likely to occur, or to assume a more aggravated form, in those persons who have not been in the habit of using soap upon the skin sufficiently. Sometimes it is important to anoint the face with oil before applying soap, especially if any of the glands are stopped. In mild cases a bit of flannel cloth stretched over the fingers should be dipped in water, rubbed upon the soap, and then rubbed thoroughly into the affected parts, which should be immediately afterwards carefully washed with water of mild temperature. This may be best done at bed-time, so that any redness or glossiness produced by the operation may disappear overnight; but in rare cases the process should be repeated in the morning.

Unnatural Dryness of the Skin.

Sometimes, however, the amount of secretion is diminished, and this condition is universal, and lasts from infancy through life. Its occurrence indicates in a most marked way the important function of these glands, for the skin of persons thus affected is dry, harsh, and easily cracks, and becomes diseased in other ways.

Treatment.—Little, if anything, can be done to cure this habit, but much can be effected for the comfort and better state of the skin by anointing it frequently with olive oil, or fresh, strained lard.

II. CHANGES IN CHARACTER.

As was stated in speaking of the anatomy of the sebaceous glands, their secretion is formed by the conversion or fatty degen-

eration of the cells which fill and line them into a clear, structureless, oily material. At times, however, this conversion is not perfectly performed, and the secretion retains more or less of its cell character. When thus modified and discharged upon the surface the skin cannot absorb it, so that it forms a scaly deposit which is greasy and moist, or dry and branny, according as the cells contain more or less oil. This condition, called *seborrhœa*, affects the face and scalp chiefly, and upon the latter it forms the disease known as

Dandruff.

After existing for some time, the hairs, deprived of their natural sebum, are apt to become dry, lustreless, and to fall before their time. Dandruff is, in fact, one of the most common causes of premature loss of hair. This condition leads, moreover, at times, to inflammatory affections of the parts affected, often to eczema of the head (see page 169).

Dandruff is a very common disease, appearing sometimes in childhood, but generally not until after puberty, and may last for years. It may occur in persons otherwise perfectly healthy, or accompany enfeebled conditions of the general system.

Treatment.—Dandruff upon the face, when mild in character and unaccompanied by redness or inflammation, may be treated by oils or soaps, as above indicated in the case of excessive secretion ; upon the scalp the same method may be pursued, or even domestic soft-soap may be used with advantage once or twice a week in place of toilet soap, and the softness of the hair restored after such frequent washings by the application of some simple pomade or cosmoline, a preparation made from petroleum (see Formulas). A stiff brush, or worse, a fine comb, should never be used to remove the scales. In severe or obstinate cases a physician should be consulted.

III. RETENTION OF SECRETION.

From causes little understood (it may be changes in the character of the sebum or in the openings of the follicles themselves), the glands often become stopped. In their mouths may be seen a plug of dried or hardened sebaceous matter, which, at first of natural color and small, may become dark or even black by collecting and retaining the dust which comes in contact with it, and larger by the addition of more sebum to it. As the secretion goes on

forming and cannot escape in consequence of the plug, it distends the gland and pushes it up into greater prominence, so that it may be seen and felt as a little elevation above the general surface. This condition is called

Comedo

by physicians, popularly *grub* or *worm*, because when the gland is squeezed there comes out a little white cylindrical body with a black head or tip. This is the sebum moulded into this shape by being forced through the narrow neck of the gland, and the black head is that portion which has been exposed to the dirt.

Comedos occur principally upon the face, the forehead, nose, and temples chiefly, but may affect any region of the skin. They are very common about puberty, and may disappear spontaneously after existing several years. They indicate a sluggish state of the sebaceous glands, and are often associated with the disorders of these organs already described. They are not necessarily connected with any disturbance of the general health. They may occur in great abundance, and when large give the appearance as if gunpowder had been blown into the face. In addition to this disfigurement they often form the first stage of so-called "pimples" of the face (*acne*). As the secretion continues to collect, the glands and the surrounding tissues may become inflamed from over-distension and form a red, more or less painful elevation or pimple of various size, which may suppurate and discharge the offending plug of sebum. In this way the comedo may be cured, but a worse evil be established. Single comedos may, on the other hand, last indefinitely, and generally they require forcible removal.

Treatment.—Comedos may be squeezed out with the nails, but they are best removed by pressing perpendicularly over them with a watch-key which has a broad edge and narrow aperture, so that it shall not cut into the skin. They will come out more easily if a little sweet oil be applied to the parts to be operated on, ten or fifteen minutes before using the key. But one or two should be removed at a time from any one small district of skin, lest too much irritation be caused by the severe pressure which is sometimes requisite, and the redness or inflammation, which results will generally disappear in a day or two. This process may be repeated each night, at bedtime, and be followed by the use of the oil and soaps as above described, for the purpose of preventing such glands from being plugged again, and of keeping others in a healthy condition. When the plugs are very small and the glands not distended, the

thorough use of the oils and soaps will alone be sufficient to restore the skin gradually to a healthy state.

Milia.

The little white, pearly, globular bodies which are sometimes seen just beneath the cuticle upon the face, in the vicinity of the eyelids, are called *milia*. A milium is a sebaceous gland which has been shut up by the closure or destruction of its neck beneath the skin. Thus deprived of its outlet the gland becomes distended by its secretion into the little cyst or tumor which has no connection with the surface.

Treatment.—These bodies may be easily removed by cutting through the cuticle which covers them to a slight extent, and squeezing out their contents by the nails.

B.—*Disorders of the Sweat-Glands.*

These affections, too, may be divided into those characterized by changes in the quantity and the quality of the secretion. Only a very brief notice of them will be given, as they are of rare occurrence.

The natural quantity of perspiration varies so much in proportion to external conditions that it is impossible to fix a normal standard of amount. Some persons sweat easily and profusely, others with great difficulty and never freely; and both are within the range of health. But some persons can be said to perspire scarcely at all, or only when exposed to an extremely hot temperature. In such individuals the glands are present, but inert. Their skins are dry and harsh, and are sometimes covered with a fine, powdery, scaly matter. This is a defect which generally persists through life, and nothing can be done to cure it. Frequent bathing and oily inunctions make the skin less uncomfortable.

Excessive Sweating of the Feet and Hands.

An excess of perspiration is shown by an unnatural and constant moisture of certain parts of the body, chiefly the hands and feet. The former feel cold and clammy when touched, and have sometimes even a parboiled appearance. They must be constantly wiped to be kept in a state of comfort. Dickens has described one of these unfortunate persons in his Uriah Heep. Upon the feet the condition is generally much worse on account of the coverings

and the pressure to which they are subject. The soles become white and sodden, and often so tender that standing or walking causes great pain. The coverings, too, become saturated with the perspiration, which after a time may undergo decomposition, and give rise to an intensely disagreeable odor which cannot be destroyed.

Treatment.—The boots and shoes thus affected must be thrown away, the person should bathe the feet once or twice daily in cold water, wear always cotton stockings and low shoes, and dust the insides of the former daily with finely powdered starch before drawing them on. In this way this horrible odor may be overcome and prevented; but when through long neglect the feet are badly inflamed, they will generally require the care of a physician.

This condition has been called "stinking foot-sweat," but incorrectly, because the secretion is perfectly natural when first secreted, and acquires the odor only by subsequent decomposition of its elements and the sodden cuticle. (See also chapter on "Hands and Feet.")

Offensive Perspiration.

There are, however, changes in the quality of the perspiration, due to the presence of foul-smelling elements which make themselves noticeable in some parts of the body to a very annoying degree, especially in the arm-pits. In some persons the odors are so penetrating and disagreeable that they may be perceived in spite of extreme cleanliness.

Treatment.—In such cases there is no other remedy than washing the parts most affected twice or oftener daily with soap and water (tar or carbolic soap being preferable), and using also, if necessary, some perfume about the clothing to overpower the unpleasant odors.

Class II.—Inflammations.

This group includes many of the most important and most common diseases of the skin, which may be separated into the transient and the chronic. In the former the course of the inflammation, either as a whole or so far as its individual forms of eruption are concerned, is of short duration; in the latter it is generally much longer, and may be indefinitely prolonged. Inflammation of the skin is indicated by such signs as redness, heat, swelling more or less diffused, or by the occurrence of red spots.

papules, blisters, pustules, etc., and by sensations of heat, pain, and itching at times. The redness, heat, and early swelling are produced by the distention of the capillaries or minute blood-vessels with blood. Its fluid portions may escape later, and cause additional enlargement of the tissues, elevating them in the form of papules, or separating the layers of skin in the shape of blisters. The cuticle may be cast off, and liquid ooze in abundance from the surface. Other elements—cells—may be added to the fluid which escapes between the layers of skin, and pustules or firmer forms of eruption be developed, and even deep-seated destruction of the lower parts of the skin be caused. These are the ordinary manifestations of inflammation of the cutaneous tissues.

A.—*Transient Inflammations.*

Among the most common examples of this form of inflammation are the so-called "rashes," or eruptive fevers—*exanthems*, as they are called by physicians: the bright red, minute spots or elevations, and diffused redness of scarlet fever, the duller red patches of eruption in measles, and the large pimples and pustules of chicken- and small-pox. But as the changes in the skin in these affections are only local manifestations of general disease, they will be treated of in another chapter (see page 69).

Erythema.

This is a name applied to various forms of fugitive redness affecting the surface of the skin. It may be either a simple passing blush, covering large districts, and accompanied at times by some disturbances of digestion and slight feverish symptoms; or an eruption of large and small red papules, situated most commonly on the face and hands, which in some cases are converted into blisters; or the outbreak may consist of both the above forms at once. Sometimes the eruption is nearly universal, sometimes is accompanied by severe pains in the joints, like rheumatism, sometimes is associated with the efflorescence of nettle-rash. All these forms are generally of short duration and of no serious importance. They are sometimes known to be caused by certain articles of diet and medicine, but generally the cause of the attack cannot be ascertained.

Treatment.—For the simpler forms a mild laxative, and frequent bathing of the affected parts with spirit and water, or saleratus water, are all-sufficient treatment.

Urticaria.

Nettle-rash—Hives.—This is a very common affection, and is characterized by the outbreak of a peculiar form of efflorescence not found in any other disease of the skin, called wheals. They are familiar to everybody as the form of eruption produced by the bite of the mosquito, flea, and other insects. There is first noticed a limited redness of the skin, accompanied by an itching and burning sensation, so that the part is violently rubbed and scratched. Soon there appears in the centre of the patch a white spot, of irregular circular shape, which rapidly rises above the general surface, and stands out in prominent contrast to the surrounding skin. Their outlines are at times irregular and notched, and the centre may be somewhat depressed. They may remain in this state for a few minutes or hours, sinking down at times as rapidly as they appeared, and leave behind them only a temporary redness, or a stain of longer duration possibly if they have been severely scratched. This is the ordinary course of an individual wheal, whether it be the result of an insect-bite, or one of a general outbreak of hives. The same appearances are produced by the sting of plants of the nettle family, whence the name urticaria or nettle-rash, from *urtica*, a nettle. In the disease the eruption may be sparse, confined to a limited region, and last but a few hours; or it may cover thickly large surfaces, or even the whole body, and not only persist for many hours, but constant eruptions may succeed each other almost continuously, or at intervals of a few hours, and thus prolong the course of the affection for an indefinite period—even months. The size of the efflorescence, too, varies greatly—from that of a small pea to uniform elevations larger than the two open hands. The surface of the patches feels hard and brawny, and is marked by little depressions, the openings of the follicles. The eruption itches intensely, and produces at times very great suffering. It is generally stimulated to appear, or is aggravated by the exposure of the skin to the air on the removal of the clothes at night, or while dressing in the morning, and may wholly disappear during the day. Acute attacks are often accompanied by some disorders of the stomach, as nausea, and chronic cases are frequently associated with and depend upon persistent disturbances of digestion. Certain articles of food are well-known causes of the disease—strawberries, shell-fish, and cheese being the most frequent excitants, but acting very unequally upon different persons and at different times. In the majority of cases, however, no cause for the attack can be dis-

covered. When caused by any special article of diet the symptoms generally last but a day or two, and two or three days may be considered the duration of most attacks ; but sometimes the disease becomes chronic, and is then the result of a general state of debility, or dependent upon disorders of the internal organs. It affects all ages. It is only of serious importance when it persists for a long time, and reduces the patient by the harassment of the nervous system, and by the sleeplessness which the intense itching occasions.

The Treatment in mild cases should be directed to allaying the irritability of the skin, and the avoidance of any exciting articles of food. The whole diet of the patient should be carefully scrutinized, and everything known or suspected to be capable of giving rise to the affection should be excluded. Sometimes every ordinary article of food must be omitted in turn before it can be ascertained if the attack be due to an error in diet or not. All hot and stimulating foods or drinks are to be abstained from, and the clothing next the skin should be either old linen or cotton. The itching and burning may generally be relieved temporarily by washes of saleratus or cooking soda, by vinegar, spirit and water, or by the application of very hot water to the surface. Chronic urticaria is one of the most stubborn affections the physician has to treat, and can only be overcome at times when the fault of the inner economy with which it is connected can be discovered and removed.

Dermatitis, Chilblains, Heat-Rash, etc.

There are various forms of transient inflammation which are produced by the action of irritating agencies upon the skin, which are classed under the general term *dermatitis*. Among the latter, excesses of temperature are the most frequent causes of mischief. The destructive action of extreme degrees of both heat and cold, in the form of scalds, burns, and frostbites, will be considered elsewhere ; the less severe forms of inflammation will be considered here.

Chilblains.

Chilblains are a low form of inflammation affecting the feet and hands—those parts which are most exposed to the chilling effects of cold. The symptoms are redness and puffiness of the skin, especially surrounding the joints, accompanied at first by severe itching and burning. Later, if the affected parts are rubbed and bruised, the skin may crack, or soften and break, and painful

sores, slow to heal, be formed. The skin of some persons is especially prone to chilblains, not only in childhood, but throughout life, which are often evidence of a general want of tone in the tissues. The disease is greatly aggravated and often directly excited by exposing the feet and hands to rapid alternations of heat and cold, as by coming in from the severe cold of winter and immediately overheating these parts, while cold or damp, at the fire or hot-air register.

Treatment.—While in their early stages of redness, burning, itching, and swelling, they are best treated by rubbing them gently at night with a rag dipped in lemon-juice, oil of turpentine, or other stimulating applications; but later, when the skin cracks, or open sores are established, more soothing treatment is at first necessary. Woollen stockings or warm gloves should be worn, and great care be exercised that the parts are not overchilled or overheated.

Heat-Rash.

During the intense heat of our summers the skin is often so over-stimulated as to become affected in several ways. The direct action of the sun upon parts exposed is capable of producing so great a degree of redness or congestion of its vessels that the skin may remain in a state of erythema for several hours or even longer, gradually subsiding to its natural condition; or a more severe degree of inflammation may be excited, the redness being accompanied by slight swelling, and ending, finally, in the death and casting-off (peeling) of the outer layers of the cuticle in thin scales, and a tenderness of the affected parts for some time. But the most common form of trouble is that known as heat-rash, or prickly heat. This is not due to the direct action of the sun's rays, because it generally occurs upon parts not exposed to them, but to the excess of work put upon the sweat-glands, in consequence of which a congestion of the tissues surrounding them occurs, manifested by the appearance of minute red points or elevations, which prickle and itch in a greater or less degree according to the disposition of individual skins. Having reached this point, the eruption or rash may subside after a few hours' or days' existence, to be redeveloped, perhaps, at the next excessive heat. On the other hand, should the great heat be of long duration, or the person's skin be especially disposed to inflammation, the simple congestion or erythema may of itself, or in consequence of the violent rubbing and scratching it generally receives, pass into a true eczematous inflammation of a mild or severe

character. In fact, a vast amount of eczema occurs every summer in this country from this cause, especially in children whose more tender skins are more easily excited by heat and other local irritants. Among the poorer classes living in crowded tenements during the summer, where, in addition to the heat, bad air, improper food, and insufficient care of the skin are to be counted as important elements of disease, the skin of children often presents much severer forms of disorder, such as boils in great numbers over their whole surface, or even large abscesses.

Treatment.—The proper treatment for skins easily affected by heat is the observance of all possible precautions against direct exposure to the sun or severe bodily exertion, so that the cutaneous circulation and the sweat-glands may be kept quiet. Should the skin be burned, it may be freely dusted with toilet powder (see Formulas), or smeared with cold cream ointment (see Formulas), to relieve the feeling of tension and the peeling. In heat-rash or prickly heat the skin may be bathed with cool water morning and evening, avoiding all friction while drying it. Thin cotton or linen should be worn in contact with the surface, which may be dusted frequently during the day with toilet or starch powder, to absorb the perspiration. Warm drinks and excessive drinking should be avoided.

Other forms of dermatitis are produced by the contact of so-called poisons with the skin :

Arnica-Poisoning.

A not uncommon cause of such inflammation is tincture of arnica, so popular a remedy for cuts, bruises, and other troubles, as an application in various forms to the skin. The symptoms are redness, burning and itching, and the appearance of fine papules and vesicles, or even worse forms of eruption upon the parts to which it has been applied. The disease is in fact an artificial eczema, and may last an indefinite time as such after being thus excited into existence. That tincture of arnica has retained for centuries its popular reputation as a household external remedy, it may thank the alcohol it contains, for otherwise it would be useless, and its dangerous action upon the skin of many persons should be better known.

Ivy-Poisoning.

By far the most common form of skin-poisoning, however, is that produced by two species of plants — poison-ivy and poison-

sumach. Poison-ivy, as it is popularly called, is not an ivy, but belongs to the sumach genus. It is rhus toxicodendron. It is sometimes a vine running over or by the side of stone-walls, fences, and ledges, or ascending trees to a great height, and sometimes a bush of considerable size and thickness. It is found almost everywhere in New England, in many places growing in great abundance, and forming dense masses by roadsides, in pastures, and along the borders of woods. Its leaves have a marked and very characteristic glossy look, and vary greatly in shape, size, and outline. They are ternate, as the botanists say ; that is, they consist of three leaflets, one terminal and two lateral, growing in common upon a rather long, semi-cylindrical stem. The leaflets are ovate, with rather a broad base, more or less pointed, and their edges are either entire, or notched and lobed in a great variety of forms. It blossoms in June, and the flowers are small and grow in greenish-white clusters, mostly in the axils. The berries are small, round, and also of a pale greenish-white color. Later in the season the leaves assume a great variety of most brilliant colors, and attract many gatherers of autumn foliage.

Of the other dangerous species of rhus (rhus venenata), although it is far more poisonous than the above, less need be said, for it grows much less commonly than the latter. It is a small tree, as its common names ("poison-dogwood," "poison-sumach") suggest, and is found mostly in swamps. Its leaflets, like those of the ordinary sumach, grow upon a long stem, and vary in number from seven to thirteen. They are smooth, broader than those of the latter plant, and the terminal one grows from a considerable prolongation of the common stem. In the autumn its foliage surpasses that of all other trees in the variety and brilliancy of its tints, and thus attracts to its less frequented haunts not a few unwary visitors.

The virulent principle of these plants is a volatile acid which exists in all their parts, but especially in the leaves. All persons are not affected by it, but many who can handle the vine, rhus toxicodendron, with impunity are poisoned by the tree, rhus venenata, so much more virulent is the latter. Actual contact with the plants is not in all cases necessary for the production of their poisonous effects, on account of the volatility of their active principle ; and there is good reason to believe that persons highly sensitive to the poison not unfrequently suffer from passing by places where the vine grows abundantly. The plant is supposed to be most actively virulent during the flowering season in early summer, but cases of poisoning occur with great frequency throughout the autumn, when its leaves take on their seductive

coloring. Even in the winter the twigs and stems are often found still alive for mischief by those who handle them.

The peculiar effect of the poison is alike in kind upon all who are affected by it, but varies greatly in intensity. The inflammation it excites upon parts coming in contact or contiguity with it is that of an acute eczema, characterized by the eruption of vesicles of a peculiar lurid or brownish-red color, which may subsequently burst and exhibit the later phases of this efflorescence as in other acute inflammations of the skin. In addition, there is more or less of swelling and redness of the parts affected, sometimes to a very marked degree, so that great deformity may thus be produced, and the face of the patient be changed out of all recognition. These changes in the tissues of the skin are accompanied by intense itching and burning, and often great suffering is undergone by the patient in consequence. Fortunately the affection is of short duration, the acute stage lasting ordinarily but a week or ten days under treatment, and its whole course rarely exceeding three or four weeks. Moreover, it is not a dangerous affection, although a person severely poisoned over a large surface may present a frightful appearance to his friends. Its effects, however, are never more than skin-deep. The eruption generally shows itself within three or four days after contact, sometimes within twenty-four hours. The period of incubation may, however, be prolonged to five or six days in some cases, and fresh blisters may continue to appear for two weeks or more. No danger of contagion by contact with the eruption upon another person is to be feared. The portions of the body most commonly affected are the hands and face, the parts naturally most exposed to contact; but other parts handled by the former, immediately after contact and before washing, may have the poison thus transferred to them, and be similarly affected. No scars or permanent injury to the skin or general system are to be apprehended in ordinary cases.

In the **treatment** of rhus-poisoning the means to be immediately used—those to which the term antidote may be properly applied—are of great importance. The poison, as has been stated, is a volatile acid. An alkali would therefore suggest itself as the most fit agent to counteract its action. Thorough washing of the parts, as soon as possible after contact with the poison, in cooking-soda or saleratus water, or in strong soap-suds, especially those of soft-soap, which contains an excess of alkali, is therefore the best primary treatment. When these or other alkaline preparations are not to be obtained, an abundance of water alone should be used as soon as possible. After absorption has taken place, or the erup-

tion has begun to show itself, less benefit is to be expected from such applications alone. Remedies are then to be used which will best control and shorten the inflammatory process in the tissues of the skin—those, in fact, which are found to be most efficacious in corresponding stages of acute eczema. Among these are some which have a special reputation, as solutions of acetate of lead or sulphate of copper, applied frequently as a wash. Perhaps nothing is better than common black wash used as an evaporating lotion for half an hour at a time, twice daily, the lime-water acting also as a chemical antidote, if possibly such action is still in season at this later stage. In the intervals between the applications of these washes the parts may be kept covered with cold-water dressings, with plasters of diachylon ointment, or with a powder of starch and oxide of zinc, according to the rules familiar to physicians for the treatment of acute eczema. By these means the process is checked and shortened, and the sufferings of the patient greatly alleviated.

A brief word of caution to sojourners in the country who are unacquainted with these poisonous plants: avoid any vine or bush growing by rocks, fences, and woodsides, with glossy leaves arranged in threes; and in the autumn, any particularly brilliant tree in swampy places, with leaves resembling, but broader than, those of the common sumach. (See also chapter on "Poisons and their Antidotes.")

Erysipelas.

Erysipelas—St. Anthony's fire is an acute inflammation of the skin, which begins abruptly, spreads more or less extensively from its starting-point, runs a definite course, and subsides of its own accord, in the majority of cases, without serious injury to the skin or the patient. In mild or ordinary attacks the inflammation is not deep-seated, the appearances being redness and swelling, with sensations of heat and tension, which may spread with a more or less well-defined border, and run over a considerable surface. After a few days the portion of skin first attacked becomes less red and swollen, while at the border the disease may still be progressing, and gradually returns to its healthy condition, leaving only a slight scaliness of the surface to mark its seat. The whole attack may not last more than a week or ten days. In more severe cases water-blisters of various size may form upon the inflamed surface, or the inflammation may extend into the deeper cutaneous structures, and matter be formed there. The constitutional symptoms are chill, fever, and disturbances of the stomach and head, varying in proportion to the severity of the cutaneous

changes. When it attacks the face and scalp—favorite seats of the disease—there is often great distortion of the features from the swelling, more or less delirium, and subsequently the hair is apt to fall, to be reproduced, however. Erysipelas of the face may be easily distinguished from other inflammatory affections of the part, which are frequently accompanied by marked swelling, such as eczema and ivy-poisoning, by the constitutional symptoms which are always present in the former, and absent in the latter. Erysipelas is apt to recur several times upon the same person, and often starts from trivial sores or wounds. It is only in the gravest forms of the disease, or in debilitated persons, that a fatal termination is to be feared. It is contagious in a moderate degree.

Treatment.—Its treatment should at once be committed to a physician.

Boils.

Boils, or *furuncles* are circumscribed inflammations about the glandular structures of the skin (in which form they do not affect its deeper portions), or diffused and deep-seated inflammations extending to the structures underlying the skin. In the first we have a moderate degree of swelling, hardness, and redness about the central painful prominence, which soon suppurates, and, if opened when ripe, discharges matter and a core, or hardened plug of dead tissue; after which the part soon returns to its natural condition, or is marked by a scar, according to the amount of cutaneous substance destroyed. In the severer forms, larger portions of skin become very hard, tense, somewhat elevated and reddened, and very painful. Finally, the hemispherical cake, which may be as big as a saucer, softens in its central part, and a large, deep slough or core, consisting of the diseased structures of and beneath the skin, is cast off. The causes of boils are not well understood. They may follow the constant irritation of the skin, produced by chronic itching skin diseases; they may occur in persons of debilitated habit; they may also occur in those in robust health; they may affect almost every part of the skin; may come singly or in crops, and in succession, so as to last a long time.

Treatment.—The smaller variety may, perhaps, be prevented, or its course be cut short by applying frequently to the skin in its formative stage some sharply stimulating substance, as a saturated solution of carbolic acid, or tincture of iodine (see Index). If, however, the inflammation has passed beyond the first stage, and matter has already formed, it should be allowed to escape by opening the boil to its bottom with a sharp lancet, or by the longer

process of softening the tissues and hastening spontaneous discharge by applying a thick layer of lard or cold cream ointment upon cloth over the part. Ordinary poultices are to be avoided, as they tend to soften the surrounding skin too much, and induce the development of additional boils. In continued outbreaks of boils, or *furunculosis*, and the more serious forms, the physician should be consulted.

Herpes—Fever-Sore—Cold-Sore—Shingles.

Herpes is an eruption of small water-blisters, always occurring in groups or clusters upon limited portions of the body, and running an acute course. The most common form is the ordinary cold-sore upon the lip, which may arise in connection with a cold, with febrile disorders of various kinds, or in consequence of disturbances along any portion of the alimentary tract, or about the genitals. It begins with a sensation of burning, itching, and tension, which are soon followed by a redness and elevation of the affected part, upon which a cluster of minute water-blisters arises. These, if undisturbed, subside in the course of a day or two, and in a few days the part generally returns to its natural condition. If, however, the vesicles be broken by rubbing or by the movements of the lips, and sometimes by the violence of the inflammation, crusts of considerable thickness will form and re-form, and the sore be protracted for some time, causing much pain and difficulty in eating and speaking. Cold-sores are apt to recur upon some persons through life.

Treatment.—They may often be prevented when in process of formation, by the frequent application of a drop of tincture of camphor ; but, when once formed, they should be as little meddled with as possible.

Shingles.

Shingles is a more extensive eruption of clusters of the vesicles of herpes occurring upon certain definite districts of the skin, and often accompanied by excessive neuralgic pain in the region thus affected. The eruption is arranged in the form of belts or zones, running down the arm or leg, round the trunk or neck, or over the face and scalp, and always follows the course of some large cutaneous nerve. It is in fact primarily a disease of the nerve-ganglion or trunk, in consequence of which the skin supplied by it or its branches becomes disturbed, and assumes such diseased action. Just such changes in the skin may be produced by wounding one of these nerves. The disease runs an acute course, the

eruption attaining its full height at any one point in five or six days, and, gradually drying up, disappears in a week or ten days longer. The vesicles at first contain clear serum, but subsequently matter or pus is mixed with this, so that they become opaque. Occasionally they contain blood. They may, especially if broken, leave permanent scars to mark their seat. The disease affects but one side of the body at once, a right or left extremity, or extends from the backbone behind, following the course of the ribs, round to the median line of the chest or abdomen in front. Upon the face it may seriously affect the eye. The affection is not dangerous, but often produces intense suffering while it lasts, and sometimes, especially in old people, the neuralgia may continue for months after the eruption has disappeared.

Treatment.—The greatest care should be taken that the vesicles be not broken. For this purpose soft and fine old linen or cotton should be worn beneath the woollen undergarments, and the eruption may be dusted frequently with fine starch or toilet powder. No other applications should be made. In cases where the parts surrounding the eye are affected, the physician or oculist should be called in at once.

B.—*Chronic Inflammations.*

Eczema.

Eczema, or Salt Rheum, falls in this division, not because it is never acute, but because it is often chronic both in the course of its tissue-changes and in its duration in individual cases. Eczema is in its many forms of very common occurrence, making, as it does, a large third of all cases of skin diseases. It is characterized by a great variety of appearances, according to the seat of the disease, its stage, cause, etc. The eruptions in the early or acute stage are generally red patches, or papules, or vesicles, or a combination of the same, confined either to a small area of the skin, or scattered over large surfaces. These may last for a short or a long time, and disappear without other changes than a little scaliness; or there may be a continuous or interrupted outbreak of similar forms of efflorescence for an indefinite period. These, like all other forms of eruption in the disease, are accompanied by a great deal of itching, in consequence of which the parts are generally scratched violently so as to produce other changes in the skin. Either by such violence or in consequence of the excessive inflammation, the cuticle is removed from the tips of the efflorescence, and the serous fluid with which the skin is filled oozes out freely,

and, drying on exposure, forms crusts of a yellowish or greenish color. If the violence or inflammation be sufficiently great, matter is also formed, or the capillaries of the skin may be ruptured, and thus crusts or scabs, composed of dried serum, pus, and blood be formed. Distinct pustules may also appear upon the skin, or large portions of cuticle be cast off, leaving intensely red and moist surfaces, which drip or ooze freely, and upon which crusts form later. All such manifestations may come and go rapidly, and the skin quickly recover its healthy condition. In case they should last a long time, however, or be frequently repeated upon any one part, a thickening of the lower layers of the skin is developed—infiltration, so called—in consequence of which the skin becomes firm, can no longer be easily pinched into folds between the fingers, and, losing its elasticity, cracks readily. Or patches of infiltration may develop slowly without such preceding surface eruptions, the skin being red, roughened upon its surface, or covered with thick scales, which may continue to form for a long time. This thickening or infiltration is the chief characteristic of chronic eczema, although it may be associated with any of the eruptions found in the acute form above mentioned, papules, vesicles, pustules, or excoriations. Eczema may last for a few days, for months, or for years continuously, affecting either a small portion of surface, whole limbs, or nearly the whole surface of the body at once. Its distribution is often symmetrical on corresponding parts of the two sides of the body. Its appearances vary greatly, as above stated, according to the parts affected. It never disfigures permanently, however severe the course of the disease. It affects all ages and classes, the robust and perfectly healthy, as well as those suffering from all sorts of internal disorders. It forms one of the most frequent and distressing diseases of infancy, most often affecting the scalp, when it is called *scald-head*, or *milk crust*; and it is apt to recur upon the same person more or less frequently through life. With the exception of the class of cases produced by the action of irritating agents directly upon the surface of the skin, as ivy and arnica above described, sugar and salt upon the grocer's hands, lime upon the mason's, potash upon the type-setter's, soap and water upon the washwoman's, heat and moisture upon the baker's, etc., we know but little of the causes of eczema. It is often hereditary, runs strongly in some families, is consistent with perfect health otherwise, and may be aggravated by, but is rarely dependent upon, disturbances of the internal economy. It is no indication that the "blood is out of order," or of the existence of "a humor," as is so generally believed. It rarely causes any constitutional disturbance, however severe, widespread, or lasting

the attack. It is never a fatal disease, except, perhaps, that very rarely, in the very old or feeble, it may prove to be the last infirmity which the system cannot stand up against. It is, however, an exceedingly distressing affection, both on account of the intense itching and sleeplessness it causes when extensive, the disfigurement it produces while present, and its great obstinacy under treatment.

Treatment.—The management of eczema is a matter of very great difficulty, for not only do its many forms of eruption demand each their own peculiar treatment, but its frequent changes make the constant observation of the physician necessary. Too often its tendency to relapse baffles for a long time his most skilful care, and temporary palliation is the only immediate result of his efforts. Until a physician can be called the distressing sensations in the skin in acute cases may be palliated by the application of oxide of zinc ointment, of starch powder, or by such lotions as saleratus water, bran water, etc. ; all friction of the skin, and stimulating and hot food and drinks should be abstained from. As already stated, there is no foundation for the so popular prejudice against the treatment of this disease. It cannot be made to "strike in" or be "driven" elsewhere, and there is no more reason why we should not cure the disease than any to which our flesh is heir.

Psoriasis.

This affection is characterized by the appearance of scattered, red, flattened elevations of all sizes, capped with thick white scales. It begins in the form of minute red points, which gradually enlarge, retaining a circular shape until they reach the size of coins of various denominations, being constantly covered with firm scales. The elevated patches may continue to increase in size until large surfaces of the skin are uniformly covered by them or by the blending of contiguous patches : but generally, after reaching the diameter of an inch or two, the centre of the patches sinks down, becomes paler, and loses its scales, while the edge of the ring-shaped efflorescence thus produced may continue to spread outward regularly or in unequal directions, so that most variously shaped patches and groups of disease are often presented in a case of long duration. The eruption, however, at any point, is always the same—a red elevated base covered with firm white scales. It may affect any part or all parts of the body at once, although in the most inveterate cases some interspaces of healthy skin always exist. Favorite seats for single patches, or at the beginning of a general outbreak, are the elbows, knees, and borders

of the scalp. It is rarely accompanied by itching, and causes no trouble except disfigurement. It may begin at any period after early childhood, and is liable to affect persons at longer or shorter intervals through life. The course of any one attack is always chronic, lasting for months or even years, and some patients are rarely free from some amount of eruption. Of its causes, except that it is strongly hereditary, we know nothing. It has no connection with scrofula or other constitutional disease.

Treatment.—In one sense it is incurable; that is, there is no surety that the disease when cured at any one attack may not recur in the immediate or distant future—the probability is that it will. This, however, is no reason why a case should not be placed under the care of a physician, for without treatment the disease may last indefinitely, and is often extremely stubborn under the action of remedies.

Acne.

Acne—Face Pimples—Blossoms.—Acne is an inflammation of the follicles of the skin, and occurs principally upon the face and upper chest. Its relations to disorders of the sebaceous glands have already been spoken of (see page 145). The plugs of hardened sebum which stop the mouths of the glands upon the face (*comedones*) prevent the escape of the sebaceous matter which accumulates, distending the gland, and, acting as a foreign body, produces inflammation of the surrounding tissues in the form of a prominent red pimple. Sometimes pus is formed in the upper layers of the skin, and converts the pimple into a pustule, but as frequently in the tissues about the base of the gland, and can be evacuated only by a deep puncture. Acne pimples may come, however, independently of any visible disturbance of the sebaceous glands, and present the same appearances as above given. The inflammation may extend much deeper than the glands too, and be felt at first as a firm and extensive swelling within the skin, or even below it, and later form nodular elevations as large as a bullet, which may last a long time, and leave deep indentations or scars behind. The eruption, therefore, varies greatly in size and duration. In mild cases it is small, and the pimples last but a week or two; but even in this form the disease may be of indefinite duration by the constant outbreak of fresh efflorescence, either continuously or at irregular intervals. It is productive of but little pain, unless the inflammation is deep-seated. Acne generally begins about the period of puberty, when it is a very common affection, and lasts for a few years, but it may appear at any time of life later, and continue indefinitely. We know but little of its

causes. It may be aggravated by disorders of digestion or by disturbances of the sexual functions, but in the majority of cases no such association can be recognized. There is a common impression that it may be produced by eating butter and fats. Articles of food fried in fat will disturb the digestion of many persons, and might thus take share in the development of the eruption in those disposed to the disease, but plain butter in any quantity is harmless. There is a modified form of the affection occurring upon the face, the nose, and adjoining portions of the cheeks, in which, in addition to the ordinary eruption of pimples of varying size, there is a great degree of congestion or redness of the parts, and often an enlargement of the blood-vessels of the skin, which may be seen ramifying just beneath the surface. This is called *acne rosacea*, or the *rose*, and affects persons generally after middle life. Still another form occurs in the bearded portion of the face, which is called *sycosis*, and is one of several affections of the parts known popularly as "barber's itch." The eruption is situated about and is pierced by the hairs. It is generally a most stubborn and distressing affection.

Treatment.—So far as acne is dependent upon disorders of the sebaceous glands, much may be done to prevent it in young people by correcting such disorders, as already laid down; nor can we expect the disease to disappear until the skin is restored to a healthy condition in this respect. Any faults of the general economy are also to be removed, if possible. The treatment of the eruption in its severe or inveterate forms is often long and difficult, but all cases are capable of great improvement or complete cure by medical skill. Its treatment should only be attempted with professional advice.

Class III.—Hemorrhages.

There are several forms of disease marked by the appearance in the skin of blood-spots. They are produced by the escape of the blood or its coloring-matter from the capillaries into the cutaneous tissues, in the form mostly of scattered, small, round spots. At first of a bright red, they may be distinguished from any of the eruptions of the inflammatory affections above considered by the non-disappearance of the redness under the pressure of the finger, for the blood, once escaped from the vessels, cannot be forced back again. Generally they are not elevated above the surface, and produce so little disturbance of sensation that their presence is often discovered only by chance. Although of bright color at first,

this soon fades to a duller shade, and assumes a purplish, bluish, and finally yellowish tint, and gradually fades away after the manner familiar to all in the so-called "black and blue" spot produced by a bruise, which is also a hemorrhage into the skin through violence. The affections of a hemorrhagic character are of different degrees of severity, and are called *purpura*, or *purples*. In the mildest form the spots are generally small, thickly scattered it may be, and occur mostly on the lower legs. There may be but a single attack, which lasts long enough only for the spots to fade away, but generally the eruption continues to appear continuously, or at irregular intervals, for some time. In more severe forms the eruption is more general, and is frequently accompanied by severe pain in the larger joints, the elbows and knees, of a rheumatic character, so that the patient is confined to the bed. In the worst forms the hemorrhage is not confined to the tissues of the skin, but takes place from the mucous membranes of the nostrils, mouth, alimentary canal, and bladder, so that blood escapes freely from the nose, is spit and vomited in great quantities, and passes away with the discharges from the bowels and with the urine. It is poured out also into the cavities of the chest. It is a most serious and often a fatal disease. We know nothing of the causes of purpura.

Treatment.—In the milder cases the limbs must often be supported by bandages or elastic hose; and stimulants, or much standing or walking, should be avoided. It is not serious, but often persistent. In the more acute variety with the rheumatic pains the patient should remain in bed, take only cold articles of food, and in both this and the general hemorrhagic form professional aid should be sought as quickly as possible.

Class IV.—Hypertrophies—Overgrowths.

All the tissues of the skin are liable to disproportionate growths, so as to make a great variety of forms of disease. Among these only such will be mentioned as are of common occurrence.

1. *Excessive growths of the cuticle.*—As the formation of this layer depends upon the upper (papillary) layer of the true skin, its overgrowth is generally associated with changes in the latter also. The principal affections of this sort are: the callus, corn, wart, and ichthyosis.

The Callus.

The *callus* is an excessive development and retention of epidermal cells over prominent joints of the bones, mostly resulting

from unusual and prolonged pressure upon such parts. We find them, therefore, mostly upon the hands, in different positions, according to their occupation, and upon the soles of the feet. They may be regarded as protective shields, and are only objects of treatment when rarely they become inflamed.

Corns.

The *corn* is a modified callus, produced in the same way by pressure, and consists of small, conical, or flattened masses of epidermis, which are constantly forced by the pressure of the boot down upon the tender tissues of the cutis, causing atrophy and often inflammation of its tissues at such points. When situated between the toes, the growth is called a soft corn, because the opposing surfaces, by their moisture, keep the cells from hardening as they form. It is all the more painful on this account.

Treatment.—With properly shaped and sufficiently large boots, corns rarely form, and will often disappear spontaneously when the undue pressure is removed. They may be best treated by painting them frequently with tincture of iodine, or a strong solution of bichromate of potash, and shaving off with a sharp knife the hardened outer layers thus acted upon. The corn doctor goes deeper and tries to remove the whole conical wedge of epidermis. The soft corn should be hardened by powdering frequently with tannin and keeping the opposite surfaces constantly apart by means of rings of felting, or little rolls of linen. For an inflamed corn, the foot should be kept in an elevated position as much as possible; evaporating lotions of spirit and water should be frequently used, and softening ointments applied. (See also chapter on "Hands and Feet.")

Warts.

The *wart* is an elongation of a group of the papillæ of the cutis projecting beyond the general surface, and covered with a thick, hard layer of epidermal cells (see Fig. 19). In its early stage it is soft and smooth, but as it increases in size the general covering of cuticle is thrown off, and the tips of the enlarged individual papillæ are seen exposed, and covered with fine epidermal caps. This is called a *seed-wart*. When seated upon the scalp the papillæ are still more prominent and distinct. Warts come and go very mysteriously, that is, without our knowing why. Situated

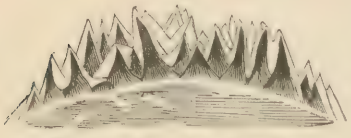

FIGURE 19.—A seed-wart.

ordinarily upon the hands, sometimes in great numbers, they may occur upon almost any part of the body.

Treatment.—They may be removed by scissors, the knife, or by tying them off with a strong thread; be destroyed by strong caustic, acids, or alkalies, or more gradually by the repeated application of lunar caustic, glacial acetic acid (see Index), or even simpler remedies at times. The growth should first be shaved down to "the quick" or the bleeding-point, and the remedies then applied. The strong caustics should be used with great caution, especially over the joints, as they often cause inflammation by penetrating too deeply, and often leave disfiguring scars. (See also chapter on "Hands and Feet.")

Fish-Skin Disease.

Ichthyosis, or fish-skin disease, consists in an enlargement of the papillæ of the skin over nearly the whole surface, with an excessive formation and accumulation of the cells of the cuticle. The skin looks as if covered with the scales of a fish, or more closely a reptile. Its surface is rough, dry, and of a grayish or brownish color where the accumulations are thickest, generally upon the outer surfaces of the limbs. The disease shows itself in early childhood, and continues through life. It is often hereditary. There is a much less serious form of dry skin, called *xeroderma*, in which the surface is more or less scaly and harsh, which is also an incurable disease. The skin in both affections may be kept in a comparatively healthy and comfortable state by the constant use of warm baths with strong soap, and the daily inunction with oils, fresh lard, or glycerine and water.

2. *Excessive growth of pigment.*—The coloring-matter of the skin is formed, as stated in the beginning, in the lowest layers of cells of the cuticle, which in the white races are very few. At times, however, these become greatly increased in numbers, and produce noticeable discolorations. The most common form is *tan* or *tanning*, the darkening of the skin under the stimulating action of the sun's rays, under which, by long exposure, the whitest skins may assume, temporarily, a color as dark as that of the mulatto. Another form is the irregular production of pigment-cells in excess, called

Freckles.

These, however, are not due to the direct action of the sun, because they not only are often present the whole year round,

but in many people cover thickly parts always protected by clothing. More conspicuous, but less widely distributed, are the irregularly-shaped patches of considerable extent, situated mostly upon the face, called *moth*. These occur frequently in women after puberty, and vary a good deal in depth of color. Although often called *liver-spots*, they are in no way connected with its functions. Rarely large tracts of skin assume quite a dark color, or are interpersed with patches from which the natural color has disappeared. General blackening is called *melasma*. *Moles*, too, and little soft tumors of the skin of various kinds, are often deeply colored by excessive pigment-cells. In all these cases the coloring-matter is situated in the lowest layers of the cuticle, and can only be removed by first removing the layers above.

Treatment.—No internal remedies will reach the seat of the trouble. In excessive freckling and moth-patches, the color may be greatly lightened or removed by the frequent or constant use of washes capable of producing an unusually rapid casting off of the cells of the cuticle, but in no other way. Preparations sold for this purpose often contain very dangerous ingredients. A solution of borax in water, a drachm to the pint, will be of service in slight cases, applied morning and evening.

Class V.—Atrophies.

Wasting of the tissues of the skin is so rare, that none of the affections included under this class can properly be mentioned here. (See Affections of the Hair, page 194.)

Class VI.—Ulcerations.

As has been stated, the cuticle is formed by the papillary layer of the cutis, and when removed by violence, or in the process of disease, is rapidly re-formed by the same agency, and no permanent injury results. Should the papillæ, however, be destroyed, the epidermis cannot be restored in this way, and the process of repair is then very slow and imperfect. Ulcers are open sores in which the skin has been destroyed or removed to a considerable and varying depth, the result usually of previous disease in the tissues of the part. In consequence of the destruction of the papillæ, or loss of vitality, or impaired nutrition of parts in which the sore is situated, the capability of repair or healing is diminished or completely suspended, and the result is a sore which

may last indefinitely, according to its nature. The most frequent example is the so-called chronic ulcer of the leg, which in the majority of cases depends upon an enlarged or varicose condition of the vessels of the part, in consequence of which the skin is not well nourished, loses its vitality, and breaks down into ulceration. This may attain a very large size, extend deeply, and is always slow to heal. It requires most judicious local treatment, and the enlarged veins of the integument subsequently need artificial compression by an elastic stocking or bandage.

Class VII.—New Growths.

This division comprises the most serious diseases which affect the skin, but which fortunately are of rare occurrence. Lupus, cancer, leprosy, and syphilis are amongst them. The only one which can properly be considered here is *vascular nævus*, a new growth of the cutaneous capillaries. They may be congenital, when they are called

"Mother's Marks,"

or start into existence at any subsequent period. The former vary greatly in size and color, sometimes covering large surfaces, and are of a bright scarlet, crimson, or purplish hue, according as they are composed mostly of enlarged arteries or veins. They are sometimes firm and flat, at others spongy and erectile. They do not increase in size except proportionately with the growth. Often new-born infants exhibit faint stains of considerable size, which gradually and completely fade out. In the other form, the non-congenital, a loop of vessels becomes enlarged, forms a small, red prominence, often upon the face, and from this, as a centre, minute vascular twigs radiate in all directions.

Treatment.—Mother's marks, when small, may be obliterated by surgical treatment; but when large and deep, cannot be destroyed ordinarily. The later forms may be destroyed in a variety of ways, and sometimes disappear spontaneously.

Class VIII.—Neuroses, or Disturbances of the Sensibility of the Skin.

There may be both a diminution and excess of the natural sensitiveness of the skin, but the most important on account of its very frequent occurrence is

Itching.

The sensation of *itching* or *pruritus* is a symptom which is often associated with skin diseases, as the result of changes in the tissues, but it occurs also as an independent affection. Pruritus may be local or general. About the anus it is a very common and excessive annoyance, lasting for years or a lifetime. It may depend upon piles, or constipation, but generally its cause is not apparent. The scratching which it provokes often excites eczematous inflammation of the surrounding skin, which may spread forward upon the genitals, and become a most distressing and obstinate affection. Pruritus of the female genitals is also common, dependent at times upon unhealthy discharges from the parts, or disorders of the internal organs. Scratching and rubbing here, too, often produce very serious disease of long duration. More general forms of itching are apt, in many persons, to come on with the cool weather of winter, especially after middle life, even with those who avoid the exciting contact of woollen underclothing. It is most violent upon the extremities, and often gives rise through scratching to aggravated forms of excoriations and eczematous inflammation.

Treatment.—For the latter form, thin cotton or linen undergarments should be worn next the skin, washes of borax or weak solutions of carbolic acid, etc., should be applied at night to relieve the itching, which is generally greatest on exposure of the skin at that time, and all scratching and friction abstained from as much as possible. For pruritus about the anus the parts should be frequently bathed with cold water; delicate and wetted paper should be used after stool; lard, cold cream, or cosmoline smeared over the parts when the itching is excessive, and no irritation of the parts practised. In itching of the female genitals the parts should be frequently bathed, anointed with any of the above substances, and left undisturbed by rubbing.

Class IX.—Parasitic Affections.

1. *Vegetable.*—There are three well-recognized diseases of the skin produced by the growth within its tissues of vegetable parasites. These growths belong to the fungi or moulds, and consist, so far as they are represented in these affections, mainly of minute spherical bodies or cells, called *spores*, and fine elongated filaments or rootlets, known as *mycelium* (see Fig. 20), which are capable of reproducing themselves when properly transferred

to other skins, and are of indefinite continuance. From what source they originally become parasitic on man is not known, nor

FIGURE 20. (After FOX).—Spores and mycelium as seen under a microscope, in the root of a young hair removed from the scalp of a patient having ringworm.

their true relations to other fungi. The most common of these affections is :

Ringworm.

Ringworm has received different names as it affects different parts of the body. Upon the general surface of the skin it is called *tinea circinata ;* upon the hairy scalp, *tinea tonsurans ;* in the beard, *tinea sycosis.* Upon the skin the disease begins as a minute elevated red spot, which increases in size rapidly, becomes slightly scaly upon its surface, flattens down in its centre, and thus makes a ring which spreads outward and may form a circle of one or more inches in diameter. Any portion of this elevated ring is composed of papules, or sometimes vesicles and fine scales. The central portion loses its redness, but may remain scaly for a considerable time. The ring may stop growing at one or more points while the remainder spreads, or new ones start up upon other parts of the surface, and thus a variety of shapes be formed. The growth is capable of spontaneous extinction, but it may cover large portions of the body. If any portion of the surface thus affected be scraped and the scaly matter thus removed be examined by a high power of the microscope, after adding a drop of a solution of potash or soda to make the cells of the cuticle transparent,

there will be seen innumerable little round bodies, $\frac{1}{1000}$ of an inch in diameter, the spores of the fungus, and a little of the filamentous growth. The plant is called *trichophyton tonsurans*. This form of the disease is very common and very contagious. A patch of it upon a child will produce others upon its own skin, upon that of other members of the family, and its schoolmates with whom it associates. It produces some slight degree of itching and burning.

Upon the scalp, the disease first manifests itself by the falling of the hair in circular spots, although not close to the skin as if shaven—as in *alopecia areata*, an affection to be described below—but by breaking off one or two lines from the surface and leaving the irregular stumps to project. The surface of these circumscribed patches is harsh, owing to the projection of the hair-follicles as well as of the stumps, and from the thick coating of dry and diseased epidermal cells and the parasitic elements present. This, however, is not the first stage of the disease, although that which first attracts notice. It is preceded generally by the same appearance of circles of erythema, spreading outward and healing at the centre, as in ringworm of the skin, but without as markedly elevated a rim as in the latter. These, being concealed by the hairs, generally escape observation, and it is only by watching the development of new points of inoculation, as the disease progresses, that its early stages may be generally studied. After gaining a hold upon the epidermal cells, as shown by these manifestations, with which we are already familiar, the fungus soon affects the hairs; they become dry, lustreless, and brittle, and break very easily, leaving the stumps projecting from the prominent follicles, as already described. As the disease spreads outward from its central starting-point, large, bare spots are formed, several inches in diameter, which may run together, and thus give rise to a very large and continuous patch; or, many separate points scattered over the scalp may give a spotted appearance to the whole head. Thus the outlines of the affection are constantly changing in every case, but the minute and surface appearances of every spot are always the same, viz.: the stumps of hair, the white scaly matter, and the prominent follicles resembling shagreen, or the skin of a plucked fowl, as variously described by writers.

Left to itself, ringworm of the scalp tends to perpetuate itself indefinitely. The hairs repeatedly fall and are reproduced, until the soil contains no more nutriment for the plant, or the follicles are obliterated by inflammation, in both of which conditions a local spontaneous cure of the disease results. It will sometimes apparently disappear more or less entirely, but almost always

acquires new life, and thus may go on for years unless arrested by treatment.

If we pull out one of the hairs changed as described, and examine it by the microscope, we shall find abundance of the vegetable growth distending its tissues.

Ringworm of the scalp is a frequent affection among children, and occurs upon the same individual and at the same time with ringworm of the general surface. The one may readily give rise to the other upon another person. In adults, however, it very rarely affects the scalp, and it may exist for months upon the hairy portions of the face, and extend from these parts over large portions of the body without appearing upon the head. It is in orphan asylums that it is most commonly found, and the introduction of a child affected with it is often the cause of an outbreak which may spread among scores of the inmates, and last for months before it can be exterminated. It causes some degree of itching, and, as just stated, occasionally a circumscribed inflammation sufficient to destroy the hair-follicles, and thus produce partial baldness ; but it does not affect the health in any way.

Ringworm of the Beard—Sycosis—Barber's Itch—presents very unlike appearances at different times—so dissimilar, in fact, as to pass generally for entirely distinct diseases. As just stated, it is in one form a very common affection among young men, and its real nature is then readily recognized even by the patient. The latter appearances are those of ordinary ringworm of the chin and those of the scalp affection just described, more or less combined, and are called simply ringworm.

It begins, as upon the non-hairy portions of the face or body, in the form of small points, which generally attain the size of a pea or a cent before they attract much attention. They spread rapidly in a circular form, flattening down in the centre as the elevated margin of papules or vesicles enlarges, and are accompanied by a considerable degree of itching and burning. The centres of the patches remain more or less reddened and scaly, but seldom present the white, branny look so characteristic of their seat upon the scalp, probably because the parts are so much more frequently washed. The sides of the face are its most common starting-point, from which the rings may spread in every direction, or new ones may be started from these upon other parts by self-inoculation, the itching causing frequent rubbing with the hands, and in this way transference of the parasitic elements elsewhere. When the circle spreads beyond the beard, the appearances of such portions of the patch are identical with those of ringworm originally started upon the general surface of the skin.

The disease may thus run on for some time in the beard without any apparent change in the hairs, but sooner or later—the period varying greatly in different cases—the hairs begin to fall from the parts affected, thus defining the patches more conspicuously than before. The hairs break off a short distance above the surface, and leave ragged stumps, as on the scalp. Ringworm of the beard primarily occurs generally upon those parts of the face which are shaven, or, in other words, upon those persons who are shaved; much less frequently upon others, for reasons to be hereafter given. After existing thus for months, possibly for a year or more, the beginning of those lesions of the skin becomes manifest which characterize the second stage of the disease. Simple ringworm of the beard becomes, in other words, *Sycosis*, which begins in the form of a small nodule about the insertion of the hair. This slowly enlarges and, if the inflammation runs high enough, discharges pus from its summit, which dries and forms a crust about the hair. This process is repeated in the individual follicles several times generally, the nodules varying in size and prominence according to the degree of inflammation. In later stages the nodules and pustules may be converted into hard and large prominent tubercles, giving rise to thicker crusts upon their surfaces as they suppurate, or forming large, raw indurations. The tissues beneath the skin may in time become involved, and large abscesses be formed. Thus the disease may go on for months or years, spreading gradually over the hairy portions of the face, and affecting sometimes the eyelashes and eyebrows. When the inflammation is excessive the hair-follicles thus affected are destroyed, and permanent baldness results. Great disfigurement and local distress are often caused by it. It forms one of those chronic affections of the beard known as barber's itch.

Ringworm of the Nails.—The last form remaining to be described is ringworm of the nails. Occasionally some one or more of the nails of persons affected with any of the varieties above described, or of those having the daily and long-continued care of such patients, lose their transparency, become opaque and dry, and gradually thicken. Their surface appears rough, and cracks easily, and their free edge is blunted. Their substance is brittle, and flakes off superficially in the form of scales. If these be examined by the microscope, the flattened cells of which they are composed will be found filled with parasitic growth.

Ringworm occurs also upon several of the domestic animals—the cow, the horse, and the cat—forming one of the diseases called *mange*, and is often transferred from them to members of the household to which they are attached. One of the most com-

mon sources of contagion is the barber's shop. How this may happen is very easily explained. To these shops, in addition to the regular customers who are not shaved elsewhere, there resorts an irregular set of residents, who are shaved sometimes in one place, sometimes in another, and also a large and ever-changing multitude of travellers. It is evident that opportunity for the entrance to a shop of cases of so common an affection as ringworm, or of one so chronic as sycosis, in all this shifting multitude, will not be wanting.

The question is, how it may be communicated from one customer to another, both of whom have their own equipments, which we will accept as reserved for their individual use? The operator uses not only the brush, but his hands also, in lathering a face thus affected. These are not always washed before they are applied to the face or apparatus of another; the razor is first stropped, without thorough cleansing, perhaps, upon the common strop, even while the act of shaving is only half finished, it may be; the towel used in wiping the face of the first goes not upon a few afterward; the comb, used upon parts of the face not shaven, goes directly to the beard of the next comer. These are the channels of communication by which these parasitic cells—so small as to be invisible, and incapable of destruction by the soap, water, or washes used during the process of shaving—may gain passage from one face to another, even when all possible precautions are observed by the regular patrons; when the common property and apparatus of the shop are employed, the danger of conveyance is of course largely increased.

There can be no doubt, too, that tinea tonsurans of the scalp may be conveyed from one boy's head to another in a similar way by the hair-cutter; but this is a danger far less to be feared than that of the barber's shop, for the affection of the scalp among cleanly children is comparatively rare, while that of the face in gentlemen who resort to the latter place, on the contrary, is by no means rare.

Tinea tonsurans is to be guarded against, therefore, in the school, whenever a child in attendance is known to be affected by it in any form: in the barber's shop, always; at home, when brought into it by any one member of the family; and at times, upon the skin of domestic animals.

Treatment.—The treatment of ringworm of the general surface is ordinarily a simple matter, consisting in the frequent application of those substances known to be capable of destroying the plant without injuring the skin, for a sufficient time to penetrate to the lower layers of the cuticle, below which its growth does not ex-

tend. The insufficiency of many of the household remedies is their superficial action, the upper growth of the fungus only being destroyed, so that the disease returns after being apparently cured. Among those which are ordinarily effective in the superficial forms are sulphur ointment, sulphurous acid solution, strong solutions of carbolic acid, and tincture of iodine. They should be applied once or twice daily, and as thoroughly as possible without over-stimulating the skin. The treatment is to be continued, in all forms, long after the surface of the skin appears restored to its natural condition. From the hairy portions—the beard and scalp—the disease is eradicated with great difficulty, because the parasitic growth extends to the roots of the hair—that is, to the lowest layers of the skin. Hair-pulling or epilation is, therefore, almost a necessity over the affected parts, by which a large quantity of the fungus is removed, and the remedies allowed to penetrate to the deepest seat of the growth. The hairs may be pulled out by tweezers without much pain, and always grow again. Treatment must always be continued uninterruptedly for months, and never given up without the assent of the attending physician.

Favus.

Tinea favosa, or favus, is by no means as common as ringworm. It may be briefly described as an affection of the scalp and external covering, characterized by the formation of large, yellow crusts. The shape of these crusts is peculiar, being concave upon their upper and exposed surface, circular or ovoid in outline, and presenting concentric rings. In size they vary from a minute point scarcely discernible by the naked eye, to flattened masses a half-inch in diameter when separate, and an eighth of an inch or more in elevation above the surface of the skin at their edges. Distinct crusts may by confluence, however, form large patches, in which their characteristic concavities may be seen more or less blended and lost. These peculiarities of shape are caused by their seat and the method of their growth. The minute elements of the fungus gain entrance to the tissues of the skin, upon which they thrive, through the opening of the hair-follicle, and from this as a central point extend downward into the hair-canal, and outward in all directions into the epidermis. At first a minute globular mass is formed, but as the growth increases peripherally it is held down at its centre by the clinging of the hair-sheath to the hair, while in the free epidermal tissues around it is allowed an upward growth. It is the presence of the hair in the centre of each crust, therefore, which mainly causes the concavity of the crusts. Upon

the scalp, where the hairs are best developed, this shape is longest retained; while upon the general surface of the body, where it is much less frequently met with, the crusts when large wholly lose this peculiarity, and form irregular-shaped masses, projecting to a much greater elevation above the surface. The color of the crusts when young is bright orange, fading to a pale lemon color when older. The odor is disagreeable, resembling, as it is thought, somewhat that of mice, a significant fact in connection with its frequent occurrence upon these animals. These appearances may be modified by the bursting of the crusts by rough handling and the discharge of their contents, or inflammation may arise beneath them from the same cause, and the pus and blood mingling with them give rise to the formation of large scabs.

Upon the scalp, however, its effects are of a more serious nature. The hairs soon begin to change in color, becoming gray or white, lustreless, stiff and brittle, and after a while break off at the surface, or are discharged by suppuration with the surrounding favus masses. In this way the disease spreads over the whole scalp in time, the baldness beginning generally at the front and lateral portions, while the hair upon the occiput may retain its position for years. The baldness may be temporary only, in case the hair-follicles are not destroyed; but the presence of so much foreign matter within them may give rise to so violent an inflammation that they and the hair-growth are forever destroyed.

Favus affects the nails too, occasionally; generally in persons either carrying the growth in some other position, or having charge of those affected by it. Their substance, which is only modified epidermal tissue, becomes yellow and opaque, their longitudinal striæ are more marked, and their surface has a rough and tuberculated appearance.

If we examine by the microscope the matter of which the favus crust is composed, upon whatever part of the body it may be growing, we shall find, in addition to more or less epithelium, innumerable minute cells of an irregular ovoid shape, attached to each other in groups or rows, and long and slender tubes. If we remove the hair which pierces the centre of one of the cups, with its sheath attached, we shall find the walls of the latter distended with the same growths, called *Achorion Schönleinii.*

Favus is a rare disease in comparison with the other vegetable parasitic affections. It is mostly met with upon the heads of poor children, for its elements seldom succeed in developing upon surfaces frequently washed or brushed. Although positively contagious, it is so in far lower degree than some of the varieties of ring-

worm, and it seldom, if ever, runs through schools and asylums like the latter. It is frequently observed upon several members of the same family, however, and to be developed successively and only after long periods of daily contact amongst its individuals. It affects children more frequently than adults, and is comparatively more common in the country than in cities. Its course is always slow; left to itself it may last a lifetime upon the scalp, or until it has entirely destroyed the hair, in which case a spontaneous cure is possible. Upon other portions of the body its duration is by no means so chronic, and its eradication by treatment, compared with its seat upon the scalp, a simple matter.

Treatment.—The treatment of favus is the same as in ringworm, but it is more obstinate even than that, and when seated upon the scalp can only be eradicated by repeated pulling of the hairs, and long continued use of so-called parasiticides. (See treatment of ringworm, on page 183.)

Tinea Versicolor.

The third of the vegetable parasitic affections is tinea versicolor, or as sometimes called, pityriasis versicolor. It is characterized by the formation upon the surface of yellowish or buff-brown spots of irregular outline, but slightly elevated, and covered with fine scales, which are easily scratched up by the nails, or removed by scraping with a knife. They vary in size from minute points to confluent patches of sufficient extent to cover large portions of the chest or abdomen. They chiefly affect the front trunk, beginning generally upon the chest, and may extend downward so as to cover more or less wholly the abdomen, hips, and upper thighs, and upward to the shoulders, and thence down to the forearms, or creep around the chest to the back. They rarely appear below the knees and elbows, or ascend upward upon the neck, and never affect the face. In other words, they do not generally grow upon those parts of the skin which are exposed to the air and light, finding rather upon those parts protected by clothing the warmth, and possibly the absence of light, essential to the development of the plant.

When once established, it seldom disappears spontaneously, but may go on for years, perhaps dying out largely during the winter, to revive and extend over wider areas during the summer. It often gives rise to great itching of the parts affected, although in some cases the patient is not conscious of its presence through any sensation it may cause. It is often mistaken for, and confounded with, the pigment-stains upon the skin called moth, liver-spots, or

chloasma, an affection differing from it in position, anatomical seat, course, and clinical history.

An examination by the microscope of a few of the scales, so easily removed, from a patch of pityriasis versicolor, will readily establish its nature. We see lying between the upper layers of epidermal cells countless numbers of round conidia or spores, grouped in clusters, of high refractive power, and resembling minute oil-globules. Associated with these are fine tubes of mycelium running in a network of endless intricacy.

The disease is of not unfrequent occurrence here, although its presence is frequently overlooked by its host, and is only discovered by the physician when examining the naked chest for other reasons. It is on this account that it has been said to affect consumptive patients especially. There is no other ground, however, for such an opinion. Its growth is entirely independent of, and unconnected with, the general condition of the person it affects, nor does it exert any injurious influence upon the same, save the itching it occasions. It is positively contagious,—husbands giving it to their wives, as above stated, and as also proved by direct experiment. The spread of the disease from one portion of the body to another is likewise affected by the transplanting of the spores in the furrows ploughed up in the healthy epidermis by the nails while scratching. Still it is not by any means so easily communicated to new hosts as *tinea tonsurans*, nor is it so easy to trace the source of contagion in any particular case. The color it imparts to the skin is a property of the fungus, as much as the yellowness of the favus crust belongs to the *achorion*.

Treatment.—The treatment is more simple than in the two preceding diseases, because the plant growth does not extend so deeply into the skin, nor affect the tissues of the hair. It consists in the thorough application of the parasiticides to the affected surfaces, with the free use of soft soap and baths, to be continued long after the disease is apparently cured; for, if a single minute spore remains undestroyed, it will gradually return.

2. *Animal parasites.*—The number of animals which have a more or less intimate parasitic relation to the skin of man—*ectozoa*, as they are called—is quite large, but we shall consider here only those which are capable of producing upon it serious disease. These are the itch insect and three kinds of lice.

Itch.

Scabies, or *itch*, is caused by the *sarcoptes*, or *acarus hominis*, a minute, mite-like animal, scarcely as large as the head of the

smallest pin (see Figs. 21 and 22); a description of it may be found in all works on skin diseases. If we transfer one of the females from a person with itch to a healthy skin, she immediately digs her way by means of her jaws into the cuticle, and burrows obliquely downward, keeping just above the true skin, and forming thus a canal, visible by the bulging of the surface above, a quarter or half an inch in length. As she proceeds she lays her eggs behind her, twenty or thirty in number (see Fig. 23), and finally dies at the end of her burrow. These hatch in succession, and the young, issuing out upon the surface, dig little pits for sustenance and for their necessary changes, and when mature the young females form other burrows, lay their eggs, and thus the stock is kept up.

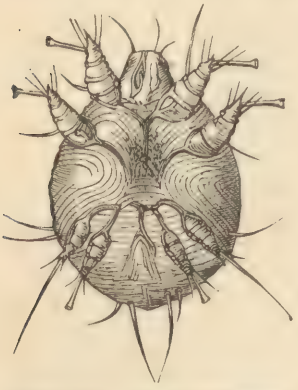

FIGURE 21. (After ANDERSON). —Male acarus, greatly magnified.

FIGURE 22. (After ANDERSON).—Female acarus and eggs (magnified). *a*, *a*, *a*, Eggs in various stages of growth. *b*, *b*, Shells from which acari have escaped. *c*, *c*, Fragments of acari. *d*, Female acarus. *e*, Larva.

Where the little pits are dug by the young and males, small papules may be produced, and these, with the burrows of the adult female, are the only changes in the skin directly due to the itch-insect. But these proceedings cause great irritation of the skin, which, with the violent rubbing and scratching that necessarily ensue, produces in most persons an eruption of papules, vesicles, and later, excoriations, pustules, and other forms of eczematous inflammation. Thus, beginning with a slight, inconspicuous eruption, confined to a small district, the disease may extend over nearly the whole surface of the body, the head alone being exempt, and present the greatest variety of efflorescences, and of the severest type. The seat is ordinarily the hands at first, because the disease is generally contracted by contact with the hands of affected persons; and the most characteristic eruption, papules, burrows, and vesicles, is found between the fingers and about the wrists, where the tissues are soft. Later these primary forms, those produced — that is, directly — by the animals, may be found over other parts of the body, but finally may be so interspersed with the eruption produced by the scratching and be destroyed by the latter, as not to be easily distinguished. From these primary forms the animals may be easily extracted with a needle, and examined by the microscope. The name of the disease sufficiently describes its most characteristic symptom—it is decidedly *the itch*. The itching is worst at night, after the patient is warm in bed, because the animals are most active when the skin is warm. The disease was formerly much more common in America than at present. During the war of the rebellion it became very prevalent in the army, and being brought home by returning soldiers, was spread widely over the country; but it has now nearly become extinct again, and is kept up to some extent by fresh importation with immigrants, as it is almost a universal evil among the lower classes in many parts of Europe.

FIGURE 23. (After NEUMANN.)—A female acarus with her burrow containing eggs. The small black dots represent excrement.

It is readily transferred from one person to another by exchanging hands while warm, and by sleeping together. It is often introduced into a family by nurses and servants, through the children, and may affect every member before its real nature is suspected. It may last indefinitely if not treated, but is easily cured.

Treatment.—The patient should be rubbed all over with soft soap, and soaked in a warm bath for half an hour, then rubbed thoroughly with some appropriate remedy for another half hour, which should then be washed off. This process, repeated for three nights, at bedtime, is generally sufficient to destroy the animals in all their phases of development. The skin will often be left in a state of inflammation for some time, varying with the character and extent of the secondary eruptions, but will generally return to a healthy state rapidly after the cause is thus removed. Sometimes, too, the skin is so seriously diseased, that the inflammation must be reduced by appropriate treatment before the proper parasiticides can be applied. No internal remedies are of use. All the underclothing worn next the skin, and the sheets used by the patient, should be put into boiling water on the first night of the cure. The most active remedies are sulphur, soft-soaps, and tarry substances mixed with lard or alcohol in varying proportions, as follows : oil of cade, soft soap, flowers of sulphur, lard, equal parts by weight ; or, oil of cade, flowers of sulphur, soft or German soap, of each, one part, alcohol, three parts—shake before using. Care should be taken not to use them too freely or too often, lest they create and sustain an artificial eczema which may be mistaken for remnants of scabies. The skin, after a prolonged attack of the disease, is often left in an irritable state for a long time.

Lice.

The lice which infest mankind are of three distinct species, and they inhabit distinct regions of the body. They are the head-louse, pediculus capitis, the clothes- or body-louse, pediculus vestimentorum, and pediculus pubis. Louse-disease is called phthiriasis. The head-louse (Fig. 24) lives only upon the hair of the head, to which it attaches its eggs, large enough to be readily seen by the unaided eye, and called popularly nits, and subsists by puncturing the scalp and drawing blood through the bite. It multiplies rapidly and produces by its ravages great irritation of the scalp. The scratching in turn excites still further inflammation, often true eczema, so that the hair is glued together by the discharges, and forms with the lice and accompanying products of disease an in-

describably filthy mass. In consequence of the inflammation the glands in the neck often become greatly swollen, and the eczema often extends to the parts below the original seat of the disease. Lice are very common among the dirty classes of society, and often find their way to the most cleanly families through the children at public schools, through wet-nurses, and are no doubt sometimes taken in public conveyances.

Treatment.—To get rid of them the scalp and hair throughout should be soaked for two hours in crude petroleum, then washed thoroughly with soap and water, and when dry, drenched with strong alcohol. This should be repeated for three or four days in succession. The nits may remain attached to the hairs, but are harmless after this treatment. They may be removed subse-

FIGURE 24.—Head-Louse.

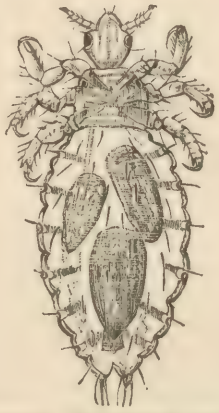

FIGURE 25.—Clothes-Louse.

quently by scraping with the blade of a knife or scissors. Kerosene may be used instead of petroleum, but sometimes produces unpleasant symptoms.

The body-louse (Fig. 25) is more properly a clothes-louse, for it breeds upon the clothing, and only bites the skin to draw blood as its food. It is somewhat larger than the head-louse, which it closely resembles. It lays its eggs in the folds and seams of the garments, and may be readily discovered by examining these parts. Its bite produces a small papular eruption, which from scratching is generally capped by a minute crust of dried blood. The whole surface, except the head and hands, which it never invades, may be thickly covered in this way, and, interspersed with it, long scratches produced by the nails occur. It is thickest upon the trunk, especially about the upper chest.

Treatment.—The treatment is to be directed to the clothes, not

to the skin, which recovers its healthy condition after the lice are destroyed. All the clothing that can be so treated should be thrown into boiling water, and the outer garments should be baked or ironed along their seams and folds with as hot an iron as can be used without burning them. The bed-clothing may be treated in the same way, but it is rarely necessary. The body may be thoroughly washed with soft-soap before putting on fresh clothing.

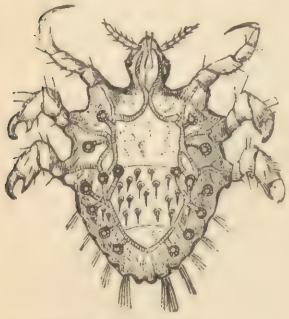

FIGURE 26.—Pubic Louse.

The pubic louse (Fig. 26) differs greatly in shape from that of the head and body, and is somewhat smaller. It attaches itself and its eggs to the short hairs of the body, especially about the genitals, but may be found even upon the eyelashes. It, too, bites the skin about the roots of the hair and produces great irritation.

Treatment.—It may be destroyed by petroleum and thorough washing, or by applying mercurial ointment cautiously to the parts overnight.

THE HAIR IN HEALTH AND DISEASE.

The hairs upon the surface of the body vary greatly in size and length, but their structure and mode of growth are nearly identical everywhere. They are developed within the so-called hair-follicles or glands, which are tubular cavities composed of several concentric layers of cells, inversions of the epidermal tissues, extending to all depths into the skin, the largest of them into the tissues below the skin even. At the bottom of the follicle its walls project upward, and form a conical body called the papilla (see Fig. 27). It is at this point that the tissues of the hair have their origin in the form of minute cells, which, at first round and plastic, become, as they are pushed upward into the canal of the follicle, compressed, firmer, and shortly assume the elongated, thread-like, interlacing shape which makes up the body of the hair. Within the follicle, too, the hair is surrounded by several envelopes composed of cells called root-sheaths. It is portions of these which are seen to be attached to the hair when forcibly pulled out. The hair proper is composed of the root, the globular, bulging part which surrounds the papilla, and the shaft which extends from the root obliquely upward through the skin and above its surface sometimes to great length. The shaft, or

substance of the hair proper, consists of three structures: The outer is a thin transparent covering of flattened scalelike cells, laid one above the other, like shingles upon a roof, to which the hairs owe their felting property. Within this is the main portion of the hair, the cortical substance, composed of compressed, elongated cells, with interspaces filled with air and pigment-matter. The centre is often more or less hollow, and is called the canal or medullary portion. The color of the hair is due to the amount of pigment-matter in the cortical portion, and of the air-spaces it contains. Connected with the upper parts of the follicles, and discharging their contents into its neck, are the sebaceous glands, the oily secretion of which is here absorbed by the tissues of the hair, and permeates its whole length, rendering it soft and glossy. The duration of life and rate of growth of the hairs vary greatly according to position and the individual; they are constantly falling and being reproduced through life. When pulled out by violence they always grow again, because the follicle which produces them is not thus destroyed.

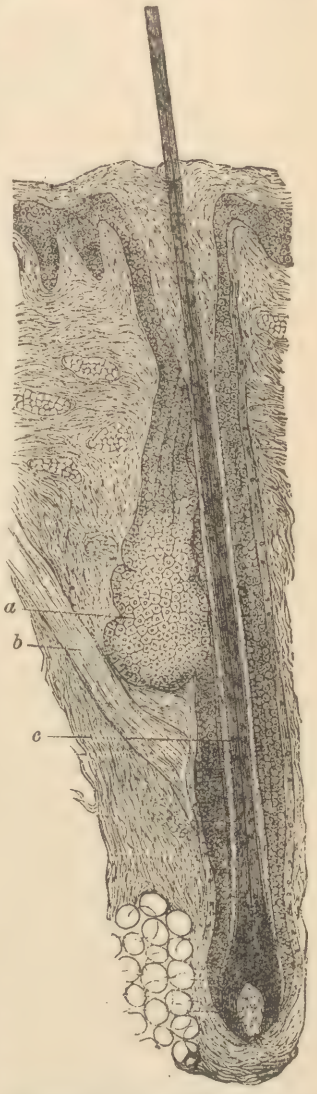

FIGURE 27. (After BIESIADECKI).—Magnified hair from beard. *a*, Sebaceous gland. *b*, Muscle which moves the hair. *c*, The hair contained in its sheath, and having at its lower extremity its enlarged root and the papilla from which it grows.

Care of the Hair.

The hair is so remotely a part of our vital organization, being in its extracutaneous portion only an appendage to the skin without sensation, that it is regarded almost as foreign to ourselves as the garments we wear. Fortunately, under ordinary circumstances it needs but little care on our part; it is more apt to suffer from improper treatment. For its management in a healthy state very few rules are necessary. The brush should be not very stiff, and should be used only often enough to keep it well arranged. Too

stiff brushes, or the too rough use of them, are of no service to the hair, and often do harm, if it tends to fall, or if there be any disease of the scalp. Combs should be used only to part or disentangle the hair, and should have blunt round points. A fine-toothed comb should never be used, and neither comb nor brush should ever be applied to the scalp for the purpose of removing dandruff; they only aggravate the disease. The scalp and hair should be washed with soap and water as often as may be necessary to keep them clean, a period which varies greatly in individuals, and according to residence. The habit of wetting or washing the hair daily is not objectionable, if there is no tendency to premature baldness. If the hair is too dry, there is no objection to the moderate use of plain pomades, but washes and dressings of unknown character should not be used. If the ends of the long hair in females become dry and tend to split, they should be dipped occasionally in a little sweet oil.

DISEASES OF THE HAIR.

Excessive Growth.

The natural quantity of hair varies greatly in different nations and at various periods of life. That form of excessive development only will be mentioned which is a source of great annoyance in females—the undue growth of the fine hairs upon the face, amounting sometimes to a well-marked moustache and beard. The trouble may begin to develop at any age after puberty, and attain its maximum growth rapidly or gradually.

Treatment.—Unfortunately it cannot ordinarily be permanently relieved. The affected parts may be shaved, but the hair grows immediately, and becomes stiff and strong, so that the process must be repeated, as upon a man's face. Caustic pastes may be applied to the skin, which burn off the hair a short distance within the follicles; but they grow again in a few days, and the process must then be perpetually repeated. Moreover, they often irritate the skin, and thus possibly promote a more active growth. The hairs may be pulled out singly with tweezers, but this does not eradicate the trouble, because they are reproduced, but after a much longer interval than by the former two methods. The only means by which a radical cure could be effected would be by destroying the follicles; but this can be accomplished only by exciting so much inflammation in the skin as to produce scars worse than the original trouble. The best treatment is to leave the growth unmeddled with, for any attempts at removal by the above

methods only make the hair more conspicuous by making its growth stronger.

Loss of Hair—Baldness.

As has been stated, each hair has an existence of its own, and ordinarily falls and is reproduced several times during its owner's life. Up to a certain period, varying with the individual, generally between the ages of twenty and thirty years, the hairs are reproduced as rapidly as they fall, so that there is no diminution in their number and length; but there comes a time with nearly every one, sometimes protracted far beyond middle life, when the reproduction is less active than the fall, so that the hair gradually diminishes in length and numbers. This is the natural process of decay of the hair, and when it comes on earlier than is natural, it becomes premature loss of hair; the hair has simply grown old before its owner. Such a condition is not uncommon, and is often hereditary. It falls earliest from the temples, forehead, and top of the head, and is more common with men. Very little can be done to prevent the loss in such cases. Baldness—partial, or universal—arises, however, from a great many other causes. It may be from a general debility of the system, shared in by the hair-producing tissues of the skin, as after fevers, childbed, etc.; from local causes of an inflammatory nature, as after erysipelas and eczema of the head, in the course of vegetable parasitic affections, as already shown; and the like. But the most frequent cause of early and progressive baldness is the disease of the sebaceous glands of the scalp called *dandruff* (see page 154). This change in the glands gradually extends down into the hair-follicles, so that the hairs fall before their time, and the successive growth becomes more and more feeble, and finally ceases entirely. The fall may begin about the temples, central forehead, or crown, and gradually extend from these centres, or there may be a universal thinning out of the hair. This affection is most common from late childhood up to the thirtieth year. A much rarer form of baldness is that in which the hair falls in circular patches—one or more—which enlarge more or less rapidly, and leave the scalp perfectly clean. This disease, the nature of which is not well understood, may extend over the whole head, and cause the loss also of the beard, eyelashes, eyebrows, etc. In young people the hair may generally be restored by treatment; in older persons the results are more doubtful. It is called *alopecia areata*.

Treatment.—The treatment of these various forms of baldness must vary, of course, with the nature of the affection. When there is any disease of the scalp, parasitic, sebaceous, or otherwise,

it of course must be removed before any restoration of the hair can be hoped for. When this has been accomplished, or in cases where the hair has fallen from lack of vitality, a more rapid reproduction may often be obtained by the use of local stimulants to the scalp, by which its circulation is made more active, and the nutrition of the follicles increased. Washes containing rosemary, cantharides, capsicum, mustard, etc., are among the best for this purpose, but their strength should be adapted to the requirements of the individual case. In some of the forms of baldness much more stimulating applications have to be employed. It may be stated, as a general rule, that shaving the scalp is always unnecessary, and that there is never any necessity of cutting the hair in these affections.

Loss of Color—Graying—Canities.

The color of the hair increases in intensity generally up to the period of puberty, retains its natural shade up to middle life, when it begins to lessen, and may, in old age, have wholly disappeared. The coloring-matter consists of a diffused and granular pigment, formed by the papillæ, and is situated in the cortical portion. If the papilla ceases to produce the pigment, the hair appears white; but in the natural process of growing gray the change is very gradual, for not only do some follicles continue to produce colored hair long after others have lost this function, but the papillæ lose this property—not abruptly, but intermittently, so that the hair, before becoming entirely white, may be for a part of its length only partially or interruptedly deprived of its colored cells. The hair, therefore, grows gray by ceasing to be colored as it leaves the follicle, and a portion once colored never loses its color. When this change begins in early life it becomes *premature graying.* This may be a family peculiarity, or the result of the weakening effects of general disease or nervous shock. The hair of a limited district may lose its color by local disturbances of nutrition, without changing otherwise in character. The possibility of sudden blanching, not by loss of the pigment, but by changes in the structure of the shaft which render it opaque, is still in question. As a rule, nothing can be done to restore the loss of color, or to delay the process of graying when once started. The only remedy, for those who desire it, is dyeing. The composition of some of the preparations sold largely for this purpose is injurious, as their employment is necessarily constant as the hair continues to grow. Cases of lead paralysis are reported to have been caused in this way.

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The Hands and Feet.

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THE HANDS AND FEET.

THE CARE OF THE HANDS.

The skin covering the hands of those who engage in mechanical occupations becomes thick and horny at such places as are subject to pressure, and in most cases the hands, as a result of constant use, become large through growth of the muscles and deposit of fat. When the skin is much thickened it loses some of its flexibility, and is more liable to crack in cold weather, or from excessive use. When, moreover, the hands are frequently washed with the aid of soap, the skin is deprived of the oil which is necessary to keep it supple, and chapping or scaling is rendered more probable. It is desirable, therefore, for those who suffer from redness and irritability of the skin of the hands, with dryness and a tendency to chap, to use other means for removing dead surface-skin and dirt than soap; and a very simple and effectual way is to wash the hands in a mush of corn-meal and water. Corn-meal contains a considerable amount of oil, which replaces that which is removed from the skin in the rubbing. If this method of cleansing be not convenient, the disadvantages of soap may be overcome by first of all using as bland a soap as possible and by carefully drying the hands afterward, and, if possible, rubbing a very small quantity of bland grease upon the parts of the hands most liable to crack; vasseline, glycerine, sweet-oil, or even mutton-fat will serve. Sportsmen often suffer in cold weather from the irritation of the hands caused by the gunpowder (probably the nitre is the active ingredient) and moisture. The protection of the hands by oil and gloves from which such fingers or parts of fingers as may be necessary have been cut off, is the best preventive. If one is obliged to handle irritating substances, particularly liquids, a little forethought, chiefly in anointing the hands, will prove the truth of the proverb, "An ounce of prevention is worth a pound of cure."

A few words may well be said about the proper care of the nails. These organs in mankind serve but little purpose compared with

their use in animals; being most useful in helping to grasp minute objects, and in some degree as a protection to the delicate pulps of the finger-tips. They grow from a pocket or fold of the skin at their roots, and from the surfaces immediately below them, as is evident on slight examination.

The space between the end of the nail and the finger is very liable to accumulate dirt, and this tendency increases with the depth of the fissure. In cleansing the nails, therefore, care should be used not to deepen this fissure by separating the nail from the flesh below it, as is pretty sure to be done when a knife-point or other similar instrument is used. It is better always to employ a brush with soap and water. Whether the nails be cut square or pointed is entirely a matter of fancy, but in any case they should be left long enough to protect the finger-tips, and should never be pared on the sides.

If it is desired to have the nails smooth, the thin skin which, if allowed to grow, extends a little way beyond the root, should never be scraped off with a hard instrument, but should rather be removed by rubbing with a towel while the hands are wet.

Children, and indeed grown persons, sometimes acquire a habit of cracking the joints of the fingers and toes. When it is wished to have taper and shapely digits, this should be avoided, since it leads to looseness of the ligaments which strengthen the joints and swelling of the sacks which cover the ends of the bones.

The habit of biting the finger-nails until the projecting tip is quite removed and the edge is left ragged, is quite common among children and, unfortunately, among adults. It always keeps the nails in an unsightly condition, and if it is carried to the degree (as often is the case) of "biting to the quick," it is a troublesome habit, as the finger-tips are rendered sensitive and "hang-nails" are often produced by it. In children the smearing of the finger-tips with something which has a very unpleasant taste will often break up the habit, for of course the biting is only habit. Extract of aloes, made into a paste with water, has been a favorite application. A strong tincture or solution of red pepper sometimes serves; adults will, however, rarely submit to such preventive treatment.

DISEASES AND DEFORMITIES OF THE HANDS.

Although the hands are exposed to a great variety of injuries, the diseases and deformities peculiar to them are not very numerous. One of the commonest, and generally of least importance, is the ordinary

Hang-Nail.

This is an injury to the flesh beside the nail, due to a slight tear. A little tongue of flesh is turned up, and, by being repeatedly struck or rubbed, presently becomes inflamed, and is a source of considerable annoyance.

Treatment.—Generally it yields readily if the part be carefully cleaned, dried with a soft cloth, and covered with a piece of adhesive plaster. The plaster should be removed daily and a fresh one substituted, until the cure is complete. If the trouble is more severe or persistent, an astringent, like powdered alum, should be slightly applied and the plaster used as before.

Run-Around, or Onychia.

This is another annoying ailment, ordinarily not of very great importance. It consists of an inflammation of the skin about the nail, characterized by the formation of a blister filled with an irritating watery matter, the blister having a tendency to extend. When the blister is broken, a raw or even ulcerated surface is left.

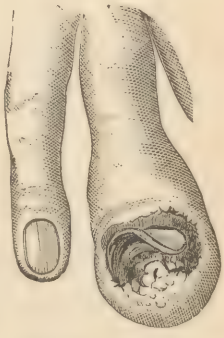

FIGURE 28.—Onychia maligna; the acute form.

Treatment.—The "run-around" is generally arrested by carefully removing the skin of the blister quite to its edge; washing away the matter and touching the exposed surface with a solution of alum or sulphate of zinc, or, in severe or obstinate cases, a stick of nitrate of silver. As the tendency to this disease generally shows a disordered constitutional condition, attention should be paid to the general health, especially to the state of the digestive organs.

An identical disease is often seen affecting the nails of the toes. A severer form of onychia, called *onychia maligna*, demands the care of a physician; but, until it can be obtained, the treatment advised for the mild form will at least do no harm, and may be of some use.

Felon.

Felon, or Whitlow, is a far more serious matter. The seat of the trouble is generally the inner or palmar side of the finger, and most commonly the pulp of the finger-end. The exciting cause of

the trouble is usually some slight injury, a blow, a prick, or inoculation with some poisonous matter. The first symptoms are deep-seated pain, throbbing, tenderness, tension, and hardness of the part affected. The skin on the sides and back of the finger presently becomes red, that on the inner surface changing little in color, owing to its thickness. As the disease advances, matter forms, and if not speedily let out may burrow toward the hand, involving its structure even, before it finds its way to the surface. If, as frequently happens, the tendons become involved, the usefulness of the finger can rarely be preserved unimpaired. After the breaking out of the matter, considerable sloughing of the soft parts follows, and too frequently of the bone also. One variety of the felon seems to begin as an inflammation of the covering of the bone.

Treatment.—In view of the severe course of the felon, it is evident that prompt treatment should be resorted to. As soon as the first symptoms are recognized, the use of the hand should cease. The diseased finger should be soaked for some time—say a half hour—in hot water or hot lye, and then covered with a light poultice of flaxseed meal, and kept elevated on a pillow if the patient lies down, or upon a high table if he prefers to sit up. Sometimes the pursuance of this treatment for a day or two, together with the use of cathartics (such as an ounce of Epsom salts, in the case of an adult, a seidlitz powder twice daily, or three compound ca-

FIGURE 29.—Position of hands in cutting a felon.

thartic or compound rhubarb pills), will arrest the disease. If not, the advice of a competent medical man should be sought at once; for, if the trouble gets a certain headway, the best surgical skill is often unequal to the preservation of the finger in its integrity. If the advice of a surgeon cannot be had, it would be probably better to trust the cutting of the finger to a non-professional hand than to allow it to take its own course. A sharp knife should be used;

the cut by preference made upon the side of the finger, to avoid the tendon, unless the trouble be at the very tip of the finger; the cut should be deep, and, if possible, to the bone, and made toward the operator, so that the natural drawing back of the hand by the sufferer shall help rather than hinder the cut. After the cutting, the part should be poulticed for a time until the dead parts of the flesh have separated, and then a stimulating dressing, such as balsam of Peru or resin cerate (see Formulas in Vol. II.) should be applied. When the process of healing is well advanced, it is well to strap the parts with strips of adhesive plaster to compress the engorged tissues; and then, as soon as the wound is healed, to begin to work the joints of the finger, to prevent the stiffening which commonly results from this disease.

Warts.

Warts are overgrowths of the papillæ of the skin with a covering of cuticle (see Fig. 30.)* The common warts so frequently seen need no description. They are commonest upon the fingers and hands, especially of young persons. The causes of warts are not very clear; certain kinds of irritating substances, such as soot, decaying matter, etc., pretty evidently tend to produce these excrescences. Some warts are certainly contagious; whether the common hand-wart is contagious from person to person is hard to prove, although a wart in any given place is likely to be followed by others in the neighborhood. It has been thought too, by some good authorities, that the blood of a wart, if inoculated upon another person, would produce warts upon the latter. Warts ordinarily give little trouble unless they are in some very inconvenient position, as upon the flexures of the finger-joints. They are chiefly sources of annoyance on account of their unsightliness. Occasionally a wart, through some irritation, may undergo such a change in its manner of growth as to present the appearance of *epithelial cancer;* these, however, are generally situated upon the face. Warts of a venereal origin are not here discussed. (See Chapter on Syphilis).

FIGURE 30.—Section through a wart.

Treatment.—Hard, dry warts are best destroyed by some chemical solvent. One of the best is glacial acetic acid. The skin around the wart being oiled or washed with a solution of

* See also the Chapter on the Skin and Hair.

soda to prevent the spreading of the acid, a drop of the latter is applied to the wart by means of a small pointed stick. Large warts, or those more full of vessels, may be destroyed by tying them firmly with a piece of strong silk, or a piece of rubber thread, such as can be pulled from an old pair of suspenders. The ligature need not be tied so tight as to be painful. Warts may also be removed with the knife or scissors, if the operator have sufficient skill to cut only the wart away, and to stay the bleeding if it be at all profuse. Mention ought to be made of the remarkable suddenness with which warts spontaneously disappear. This peculiarity has given credit to many popular cures, and even charms. The writer has often been amused to find himself the reputed possessor of great skill or magical endowment in this direction. [This sudden disappearance may be explained in the following way : The over-grown cells cease to be developed from below and are replaced by cells of healthy character, which gradually push the others upward until they are only kept in place by a feeble connection with the cells below. Some ordinary friction may now serve to rub them off (just as a loosely-attached scab may be removed from the surface of a sore which has quite healed), and their fall leaves the healthy layer of the skin uncovered.]

Deformed Hands and Feet.

Clubbed Hands is a rare congenital defect, and can scarcely be managed successfully without surgical attention. The best that can be done at home is to manipulate the deformed hands in a manner calculated to bring them toward the normal position, following the general principles mentioned below when speaking of the treatment of club-foot.

The commoner *deformities of the fingers* are adhesions of two adjoining fingers (Fig. 31, Nos. 4 and 5), and the contraction of one or more fingers toward the palm of the hand. The former cannot be managed by domestic practice. The latter may be somewhat improved, and perhaps overcome by constant manipulation. If there are wounds or burns in the palm of the hand, the prevention of deformity should be sought by keeping the fingers straight by means of a splint of wood or pasteboard during the process of healing.

Children sometimes present at birth more than the usual number of fingers and toes (see Fig. 31). In most cases the "supernumerary" members (as the extra ones are called) are imperfectly developed and not capable of being moved independently of the

others. This peculiarity is very frequently inherited, and capable of being traced through several generations. When the extra

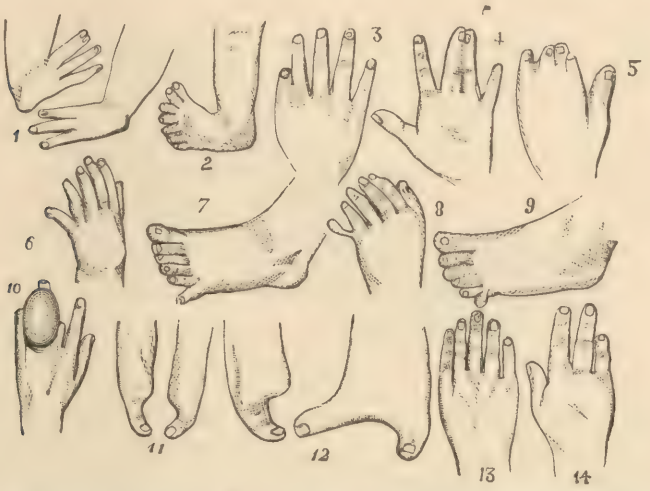

FIGURE 31.—Varieties of deformities of hands and feet showing deficient fingers (Nos. 1, 11, 12, and 14); supernumerary fingers (6, 8, and 13), in which last the thumb is wanting; supernumerary toes (2, 7, and 9); adhesions of fingers (4 and 5); overgrowth of a finger (10).

members are in the way or unsightly their removal by proper surgical means is usually a simple procedure, and not attended with special risk.

Cold and Moist or *Hot and Dry Hands* generally depend upon some constitutional cause, and, beyond the observance of regularity of diet and the ensuring of the performance of the digestive function, little can be done without medical advice, and frequently but little with it. Excessive perspiration of the hand, when so profuse as to be a source of discomfort, may sometimes be relieved by using astringent washes; of which a solution of alum (a teaspoonful to a pint of water), or a tea made of white-oak bark (half of an ounce to a pint of water) are safe and efficacious.

THE CARE OF THE FEET.

The care of the feet should receive some attention before their diseases and deformities are discussed. Some deformities are congenital, but more are acquired, and so, too, are most of the diseases of this part of the body. The main causes of this group of maladies are neglect of the proper care of the feet and the improper construction of shoes.

The normal foot is sufficiently rare in adult life to make some

comments upon such of its peculiarities as are changed by the disorders, not out of place here. The architectural idea, so to speak, of the foot is an arch. The chief arch is upon the inner

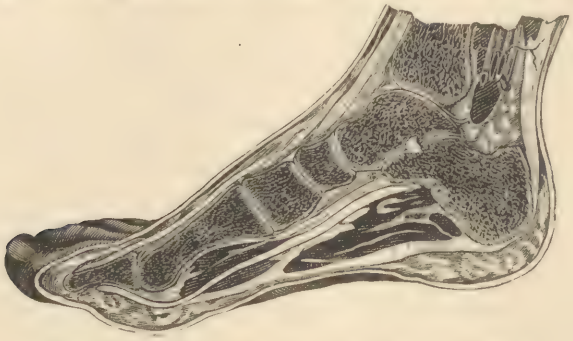

FIGURE 32.—Section through a foot of natural shape.

border of the foot, resting behind upon the heel and before upon the base of the great toe (see above). This arch is tied by the *plantar fascia*, a strong fibrous structure in the hollow of the foot and extending from the heel-bone forward to the front of the foot. The outer margin of the foot is very slightly arched and nearly its entire length comes to the ground in walking. Next in importance to the first-named arch is the transverse arch resting upon the bases of the great and little toes. This arch is very flexible, expanding readily sidewise when weight is brought upon it. Another peculiarity is the direction of the axis of the sole. Thus, a line drawn corresponding to the axis of the great toe, if prolonged backward, would cross the point of the heel. This may be seen by inspecting the sole of the foot of an infant that has not worn hard shoes or tight stockings. If such a child be placed upon its feet, with the inner borders touching one another, the great toes will not diverge from each other, but will lie side by side, until the point where the toes round off is reached. This fact is of special significance with reference to the origin of bunions.

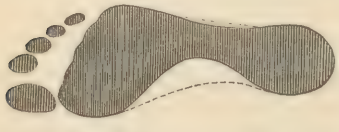

FIGURE 33.—Diagram of the portion of the healthy foot which comes into contact with the ground.

To keep the feet in a perfectly healthy condition, they should receive the same care that is bestowed upon the hand. They should receive a daily bath, preferably at night and in tepid water, and afterward be carefully dried, especially in places liable to cracks (as between the toes), and warmed, except in quite warm weather. For aged or feeble persons a sponge bath of spirits and water is

safer. If the feet are very subject to irritation, the bran bath is useful, and, if the person be very liable to "taking cold," salt may be added whenever the warm bath is used. A few moments' care after the bath, if it be used daily, will keep the feet free from corns and callosities. The readiest method is to scrape them with a dull knife or sand-paper. This care of the feet is especially requisite when they are subject to more than usual irritation, as in marching, hunting, etc., or even if the occupation be one that keeps a person very constantly upon the feet.

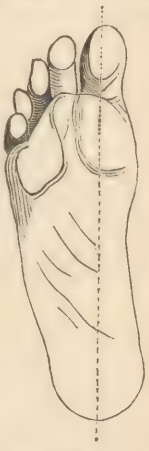

FIGURE 34 was drawn from the sole of a two-years old child whose foot had very nearly preserved its normal shape. The dotted line shows the axis spoken of.

The dress of the foot is of great importance. The stocking should be soft and not too thick. In warm weather, silk or thread ones may be worn; in winter cotton ones are necessary, and if there be much exposure to cold and damp, and the circulation be feeble, woollen stockings are desirable. The extra warmth of the wool is often offset by the tendency to perspiration they excite. The stocking should be amply long and wide at the toes; a narrow-pointed stocking often having a decided influence in crowding the toes together. The seams should be so placed as not to press upon joints or sensitive points. When a long march is to be undertaken chafing will be prevented to a great degree by rubbing the inner surface of the stocking over the sole and back of the heel with common yellow soap. This is an old and well-approved preventive of irritation from long walking.

The shoe should have a sole longer than that of the foot, and likewise wider. Its shape should correspond to that of the normal foot, and not to the foot in its actual distorted condition. The heel should be low and broad. The upper leather should be soft and pliable—never patent-leather, as it confines perspiration; snug over the instep; looser, but not baggy, across the base of the toes; and large enough to give play to the toes in front. The elastic or laced shoes are the best, as they adapt themselves more agreeably to the instep and ankle than buttoned boots. The ordinary last has but slight reference to the shape of the foot. The following figures, with the one just preceding, will explain this fact. They are taken, with slight modification, from the popular but truly scientific pamphlet of Dr. Hermann Meyer,* from which most of the recent popular treatises on the feet have taken their anatom-

* Die richtige Gestalt der Schuhe, Zürich, 1858.

ical facts. That proposed by Prof. Meyer, and bearing his name, is the best, but can hardly claim to conform to ordinary ideas of the fashionable. Of late years shoes have been sold in this country with an upward curve in the sole, to correspond to the transverse arch above described. This is of doubtful utility, except when the natural tone of the parts is so impaired as to permit dropping of this arch. In health the play of this arch is a function which should not be interfered with. The comfort of the feet is greatly increased by frequent changes of the shoes, daily at least. In this manner any points that may have received undue pressure are relieved before any considerable irritation has resulted.

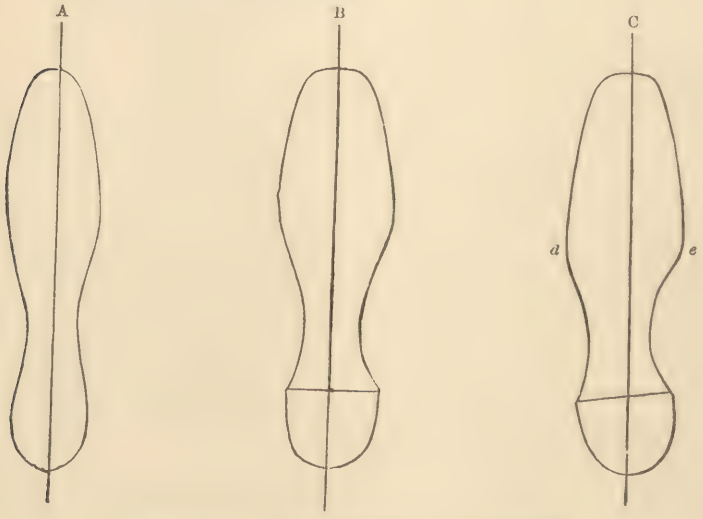

FIGURE 35.—Faulty construction of shoe-soles.

Fig. 35.—A shows the sole of an ordinary "straight" shoe for women. B the same for a man. C is the sole of a right (man's) shoe of the ordinary "right and left" pattern. If Fig. C is laid upon B, it will be seen that all the difference is in the shank behind the line *d e*, the forepart of the soles being identical. The dotted line *c, d*, is a prolongation of the axis of the great toe. [See Fig. 36, C.]

Fig. 36.—A, B, and C show the deformities of the toes resulting from the use of such shoes as have been described. A was drawn from a girl æt. 22; B from another under thirty years of age. The dotted line in A shows the ordinary relation of the sole of the shoe to the sole of the foot. The upper leather projects beyond the sole

at the sides to accommodate the foot, and so makes pressure, not upon the sole of the joints which is prepared for such pressure, but

FIGURE 36.—Deformities of the toes from badly shaped shoes.

upon the sides of the joints, with a tendency to crumple up the foot.

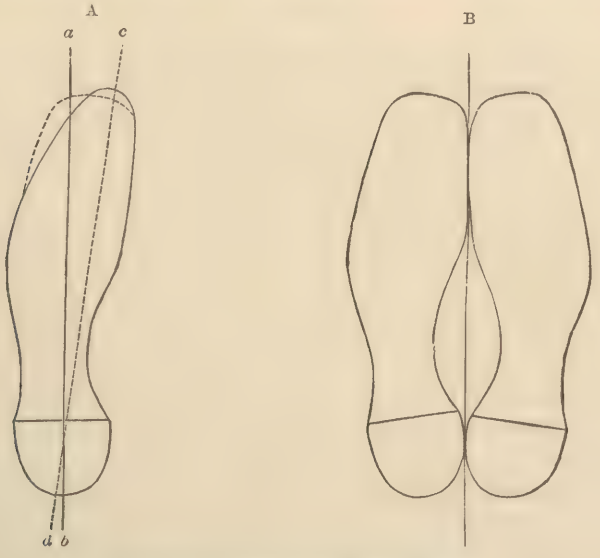

FIGURE 37.—Soles of the "Meyer" shoe.

Fig. 37.—A shows the sole of a shoe constructed on the principles laid down : *a b* is the axis of an ordinary shoe ; *c d* is the axis

of the foot and of the "Meyer" shoe. The dotted line shows the same shoe with a broad toe. This variation is simply a matter of taste, since the position of the toes will not be modified by the change, the turning inward of the line of the sole occurring after the tip of the little toe has been passed.

Fig. 37 shows the soles of a pair of properly constructed broad-toed shoes, and the departure from what has usually been a fashionable outline.

Shoes of this pattern are not easily obtained, except in the larger cities. In England, and to some extent in this country, they have become known under the trade-name of "Waukenphast." The great comfort of a properly constructed shoe is such that one who has once worn them will not willingly go back to the ordinary form of shoe.

Fig. 36.—C shows the foot of a young man which was tolerably free from distortion. It might at first sight pass for a sound foot; but the axis of the toe, *c*, *d*, does not correspond with the axis of the foot, *a*, *b*, as it should in a perfectly normal foot.

DISEASES AND DEFORMITIES OF THE FEET.

Corns.

Corns are excrescences, or indurations of the skin, due to an intermittent pressure or friction severe enough to cause irritation, but not severe enough to produce a blister. Corns may occur elsewhere than upon the feet, but they then generally receive the name of callosities. Popularly corns are distinguished as hard and soft, but both those classes really contain several kinds of corns. To avoid prolixity, however, the popular classification will be here retained. The *soft* corn is situated always between the toes; is due to the pressure of one toe against another, and is kept soft by the moisture of the parts. It generally consists of a spongy, white elevation, really an overgrowth of the papillæ of the true skin, and often takes its rise from the base of a blister previously existing. The sensation caused by it is generally one of burning or scalding, and frequently as if some small foreign substance, as a grain of sand, were between the toes. Akin to this variety are the large wart-like corns upon the sole of the foot, and certain exceedingly sensitive corns which have but slight induration, and are marked with specks and lines of white. The *hard* corn obtains its characteristic from indurated cuticle, disposed more or less distinctly in layers. This is much the commonest variety, and is found upon the prominences of the joints of the toes, and in similar situations.

The sensations experienced by sufferers from this variety of corn are burning, darting pains, great sensitiveness on walking, with an exaggeration of all forms of distress in damp weather, or when the corn has been neglected for a time. A hard corn of long standing sometimes by its pressure destroys the underlying true skin, and a cup-shaped depression in the centre of the corn results ; this has received the name of fibrous corn.

The Treatment of corns is ordinarily simple enough, but must be persistent to be effectual. First of all, the sources of irritation that occasion them should be avoided as far as possible. Some of these have been hinted at in the remarks above upon the care and clothing of the feet. If daily, or at least several times per week, after the warm foot-bath, the corns be pared or scraped with a dull knife, or rubbed down with a piece of pumice-stone, or of sand-paper wrapped about a small flat stick, little trouble is likely to be experienced. The severer forms of corns are generally the result of neglect. Persons who are timid about using hot or warm foot-bath may soften the corns by covering them on retiring with a piece of lint or linen, soaked in warm water, or a solution of washing soda, and laying over this a piece of oiled silk. By morning the hardened epidermis will be sufficiently softened to be easily scraped away. The corn, if particularly sensitive, may then be guarded from pressure by the use of one of the corn plasters sold in the shops, or by a plaster made extemporaneously by speading a little diachylon plaster (or even yellow wax, if nothing better be at hand) upon lint, and laying two or three pieces together to give sufficient thickness to the plaster. The centre of the plaster should be cut out, in order that pressure shall be made around and not upon the corn. Many nostrums for the cure of corns are sold, or have popular repute. A safe rule, however, is, to avoid all "corn cures" the composition of which you do not know ; for all violent applications are dangerous except in experienced hands. Glacial acetic acid is probably the safest of all very effectual destroyers of corns or warts. To avoid accidents, the skin immediately around the corn should be oiled, and the acid carefully applied by means of a small stick, like a match-stick, sharpened. These forms of treatment are simply palliative, as a rule ; removal of the corn entirely by a skilled hand is more effectual. Incomplete removal, as is generally practised by professed chiropodists, is only palliative. This incomplete operation generally consists in the extraction of the centre of the corn, ordinarily composed of vertical fibres, and the leaving of the margin of the corn as a protection from pressure to the sensitive centre. This can be done by the patient himself by previously softening the corn, as above directed, then

seizing the centre (called popularly the "eye," or "core") with a pair of tweezers and carefully cutting around it with a pointed knife or pair of scissors, going as deeply as can be done without drawing blood or touching "the quick." Inflamed corns must be treated with rest, cold applications, or poultices, as the case may be. Corns that have suppurated and have remaining openings leading into them would better be treated by a competent medical man, if his advice can be obtained.

Soft corns are best treated by the application of a strong astringent, tannin, for instance, and the separation of the affected toe from its neighbor by the insertion of a bit of linen or lint.

Bunions.

In every part of the body there are interposed between the skin and projecting parts of bones, or between parts liable to friction against each other, little sacks containing liquid, and called in anatomy *bursæ*. A number of these bursæ exist in the foot. When they become enlarged, as the result of irritation, and the overlying skin is inflamed, they are styled *bunions;* but the term is generally restricted to this affection when situated on the base of the great or little toe. The name is, however, carelessly applied to corns or simple irritations of the skin in these situations, and it not infrequently happens that a corn may be placed upon a true bunion.

FIGURE 38.—Deformity of foot from bunion and pressure of badly fitting shoe.

The exciting cause of the bunion is always a badly constructed shoe; that is, one too narrow at the front part, which crowds the great toe outward,* or the little toe inward from their proper direction, and at the same time makes pressure upon the distorted joints. The first symptom is the irritation of the skin, then the over-filling of the bursa. If this warning be heeded and rest be given to the affected part and pressure removed from it, the trouble may nearly disappear. But if it be neglected, the joint enlarges, becomes red, and exceedingly intolerant of pressure and friction. When the trouble is once established, it is liable to become chronic with increase of the severity of the symptoms from time to time.

* It should be noted that here, as in all writing referring to anatomy, "inward" means toward the centre line of the body, and "outward" from that line; otherwise, it might be supposed to refer to the centre line of the foot.

This is particularly true of gouty or rheumatic persons. Sometimes matter forms within the bunion which may result in its cure, or a tedious and troublesome discharging opening may be left. In the worst cases the joint becomes involved, and the cutting out of the joint becomes necessary.

Treatment.—The *preventive treatment* of bunions consists in guarding against such defects in the shoe as will deflect the toes from their normal direction. If the distortion has already been acquired, shoes of proper shape and ample size should be worn, and pieces of lint or soft sponge inserted between the great toe and the next (or between the fourth and fifth toes, if the little toe be the one affected), so as to bring the former back to its proper line. The same may be accomplished by carrying a narrow strip of adhesive plaster from the outer aspect of the great toe around its point and down the inner border of the foot. The palliative treatment of bunions, such as protecting it with plasters, the use of alkaline washes, etc., is essentially the same, the necessary changes having been made, as has been given above for corns.

Ingrowing Toe-nails.

This is a malady affecting almost exclusively the great toe, and by preference its outer side. Its causes are: a shoe too narrow across the toes and a faulty manner of cutting the nails; gener-

FIG. 39.

FIG. 40.

FIGURE 39.—Onychia of a toe. (See page 201.)

FIGURE 40.—A bad case of ingrowing toe-nail. The point to the right is a protrusion of the nail through the overgrowing flesh. A cut has been made through the flesh on the left side, down to the nail.

ally the two causes are combined. By the sidewise pressure of the shoe the nail is bent at its edge and forced down into the flesh; the flesh is crowded in the opposite direction upward over the nail.

The sufferer endeavors to relieve himself by cutting away the offending part of the nail; this only enables the flesh to ride higher over the nail and the sharp corner of the latter, which is generally left, irritates more and more the flesh. This becomes inflamed, enlarges, and finally ulcerates. As the apparently trifling disorder may render walking impossible, it often demands serious surgical treatment.

Treatment.—Of course the first indication should be the removal of the known causes; the narrow shoe and the paring of the nail should both be abandoned. If the trouble has not advanced very far, the relieving of pressure, the allaying of inflammation by cold water dressings or applications of sugar-of-lead water or a solution of sulphate of zinc five to ten grains to an ounce of water, and the elevation of the nail by the gentle insinuation beneath it of threads of lint or cotton-wool, to be changed daily, will in a short time generally effect a cure. The cure may be assured by continued avoidance of the causes before mentioned. If the ulceration be considerable, the application of the solid stick of nitrate of silver is often efficacious, and it has been claimed that the perchloride of iron freely applied has cured cases in which the removal of the nail had seemed unavoidable. Unfortunately many are allowed to reach such a condition that the removal of a part or the whole of the nail is the only effectual treatment. This should of course be done only by a competent surgeon.

Chilblain.

Chilblain is the comprehensive name given to several affections, generally arising from exposure to a low temperature with a subsequent change—generally sudden—to a warmer one. Some persons are more subject to this than are others—children more than adults. The common form of chilblain is a dusky-red, shining spot upon the skin, attended with great itching or burning and tenderness. The commonest situation is upon the toes or heels; but the hands, ears, and nose are also affected, parts, it will be noticed, in which the circulation is relatively feeble, and which are exposed to the severest cold. The pain or itching is generally periodical and may be excited by warmth, the taking of a meal, etc. Other forms of chilblain more nearly resemble frost-bites, those, namely, in which blisters are formed, or worst of all where the flesh dies and ulcers are formed.

Treatment.—If the special exposure to cold be known, the chilled members should not be brought at once near the fire, but they should be very gradually warmed by enveloping them in woollen

cloths and by holding them with warm hands, without rubbing. If the "frosting" be severe, the method of immersing the part in cold water which is allowed to become warmer, or is gradually warmed by the addition of small quantities of warm water, seems to be as judicious as any ordinarily at command. If, as is usually the case, the chilblain is already established, the treatment is to relieve the suffering. The avoidance of marked cold or dampness, or of unusual heat applied to the affected part, is of prime importance. The itching is often relieved by the application of soap liniment, of spirits of camphor, of spirits of turpentine and olive-oil. The common kerosene-oil, either alone or mixed with olive-oil, has a repute as a very comforting application. A great number of other mixtures have been vaunted, but those mentioned are as valuable as any. If the parts be ulcerated, a mixture of equal parts of Peruvian balsam and castor-oil applied on linen or lint is of much service. In the severer forms of chilblain the advice of a physician should be taken if possible.

Perspiring, Hot, and Cold Feet.

Perspiration and disagreeable odor of the feet are generally best combated by strict attention to the care of the feet, as directed above. Astringent washes may sometimes be used to diminish the perspiration. As these conditions, when they persist in spite of rigid cleanliness, are generally due to some constitutional trouble, medical advice should be sought regarding them.

Unusual *coldness* or *heat* of the feet are also, as a rule, the manifestation of a disturbance of the circulation, and if a proper attention to the clothing of the feet does not remove the trouble, medical advice should be taken.

Stone-Bruise.

A disease of common occurrence in the country or wherever children go bare-footed much is the *stone-bruise*. This very much resembles some of the forms of felon, and is, like them, due to slight injuries ; in this instance to blows received from inequalities of the ground in walking. Naturally, the stone-bruise is generally situated in those parts of the foot that come to the ground in walking, and is especially common in the balls of the toes, as they are most exposed to injury. There is, generally, a deep pain, with tenderness, some swelling and hardness to touch, but rarely redness.

Treatment.—When these symptoms appear in the foot of a per-

son who has been going barefooted, the foot should be soaked for some time in hot water; if there is much callus on the foot over the tender place, some alkali, such as common washing soda or potash, should be added to the foot-bath, or hot lye may be used for the bath. The callus should then be gently scraped away. Sometimes this treatment, followed by rest and a water-dressing, arrests the trouble. If not, a water-dressing or poultice should be applied until the formation of matter can be recognized, when it should be opened with a sharp knife. The wound should be kept open until matter ceases to form within the cavity of the abscess.

Fissures of the Toes.

Cracks or *Fissures* between or beneath the toes are generally due to acidity of the perspiration. They generally readily heal if the feet are frequently bathed and carefully dried. In very warm weather powdered starch or toilet powder may be applied with benefit. The itching arising from these fissures can be quite certainly allayed and the crack healed, by putting between the toes a small piece of linen, or a soft thread of lint dipped in glycerine, or oil if preferred, in such a manner that the thread or edge of the linen enters the crack and keeps its surfaces apart.

Clubbed Feet—Talipes.

"*Club-foot*" is a name applied to several deformities of the foot. The corresponding surgical name is *talipes*. The several varieties of talipes are designated by the second name of *varus*, *valgus*, *equinus*, *calcaneus*, etc. *Varus* is where the toes turn inward and the inner border of the foot is turned more or less upward (Figs. *c*, *d*, *e*). *Valgus* is where the toes turn outward, and the inner border of the foot is somewhat dropped (Figs. *f*, *g*). In *equinus* the heel is raised and the toes dropped (Figs. *a*, *b*). In *calcaneus* (Figs. *h*, *i*) the reverse is true. These varieties are often combined one with another. Varus is by far the most common, and is the true club-foot of the popular nomenclature. Club-foot frequently is found existing at birth, but it is often acquired in childhood as the result of diseases affecting the nerves and muscles of the leg. The proper

Treatment of the deformity demands skilful surgical attention; but in the absence of this much may be done through the assiduity of the nurse, and in the same way, too, the surgeon may be greatly assisted. The management of these cases is easier in proportion as it is begun early. If, then, a child is born with, for instance,

talipes varus, the attendant should proceed as follows : She will seize the foot firmly with the hand, and gently and gradually bring it toward its proper position. As this is done, the foot loses its characteristic red color and becomes quite white. The foot, probably, cannot be brought entirely straight at first, and when this whiteness becomes well marked, the foot should be so held for a

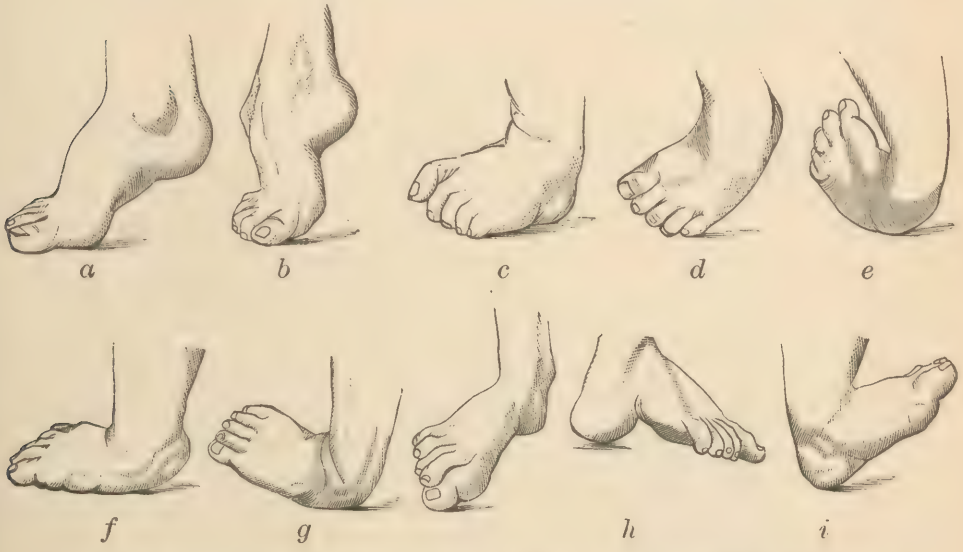

FIGURE 41.—Different varieties of club-foot or varus : *c*, *d*, *e*, three degrees of severity of talipes varus existing at birth ; *a*, *b*, talipes equinus—the latter is the acquired form ; *f*, *g*, varieties of "splay-foot," or talipes valgus ; *h*, *i*, two varieties of talipes calcaneus.

moment and then allowed to fall back. This manœuvre should be several times repeated, every time the child is dressed and undressed, and if done gently the feet may be subjected to almost constant handling during the waking hours of the child with the result of gradually coaxing them into their proper position. To prevent the skin from becoming chafed in this process, it should be powdered freely, and it is well to wash the feet with a solution of alum in alcohol or spirits. It sometimes occurs that this persuasive method of treatment is sufficient. But after the lapse of a short time, when the skin is hard enough to endure the contact of adhesive plaster, a strip of this from three-fourths of an inch to an inch in width should be applied, beginning on the inner side of the foot just behind the base of the great toe, passing under the sole of the foot and up on the outer side of the leg. This may be kept in place by a light flannel bandage, if the nurse can lay it even and without making wrinkles. The plaster alone, however, will

do the same good without the bandage, but is more likely to slip or be dislodged. It should not be forgotten that the best surgical advice that can be obtained should be had at the *earliest possible* time; in the meantime the manipulations above mentioned should be faithfully attended to. To enter into detail of the subsequent treatment would carry us beyond the limits of this chapter; the requirements of each case must be determined by the surgeon to whom it is presented.

Flat-Foot.

A painful condition of the feet is *flat-foot.* It is one variety of splay-foot, and consists in the dropping of the arch of the foot, owing to the relaxing of the ligaments and their yielding beneath the superincumbent weight. This accident is generally attended with great pain upon walking or long standing. If the arch be quite dropped, the cause of the pain is readily guessed; but in cases where the deformity is very slight, its real nature is quite likely to be overlooked.

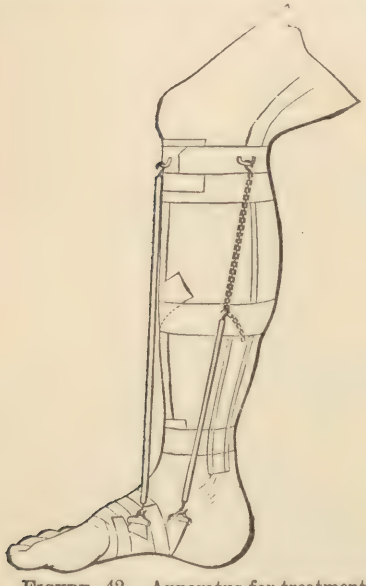

FIGURE 42.—Apparatus for treatment of flat-foot.

Treatment.—The intelligent treatment of the trouble demands professional knowledge, but in the absence of this the pain and discomfort may be mitigated by arranging a soft but firm pad fitted to the sole of the arch while the latter is kept in its proper position. This pad may be fastened to the sole of the shoe beneath the insole, so that it will give to the arch the necessary support in walking. The pad may be made from a variety of substances; rubber is very good, owing to its elasticity; cork will serve very well. A number of trials and much paring and trimming will probably be necessary to the making of suitable support. A much more successful method is the one illustrated in the above figure, in which heavy adhesive plaster is so arranged as to pass under the instep and connect with india-rubber cords or tubes attached to the leg above by means of metal plates and adhesive plaster. This, however, requires the aid of a physician for its management.

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The Eye and its Diseases.

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THE EYE AND ITS DISEASES.

THE ANATOMY AND PHYSIOLOGY OF THE EYE.

THAT which we are accustomed to call THE EYE is a complicated structure of many different parts, not all of which are directly concerned in the act of vision. The whole may be properly termed *the visual apparatus*, and it may be conveniently described under four heads : (1) The Orbits ; (2) The Eyeball, or Globe of the eye, —the eye proper ; (3) The Optic Nerves ; (4) The Appendages of the Eye.

The Orbits.

The Orbits are the bony cavities in the front of the skull, in which the eyeballs are contained. (See Fig. 43.) They are shaped like four-sided pyramids. The small ends of these pyramidal cavities are directed backward and are each pierced by an opening called the *optic foramen* (Latin, *foramen*, an opening), through which run nerves and blood-vessels. The large ends of the orbits open upon the face, and these facial openings have a strong, bony edge which protects the eyeball from blows, etc. The orbits are lined by a layer of fatty material, which forms elastic cushions for the eyeballs to rest upon, and thus gives them still further protection against injury.

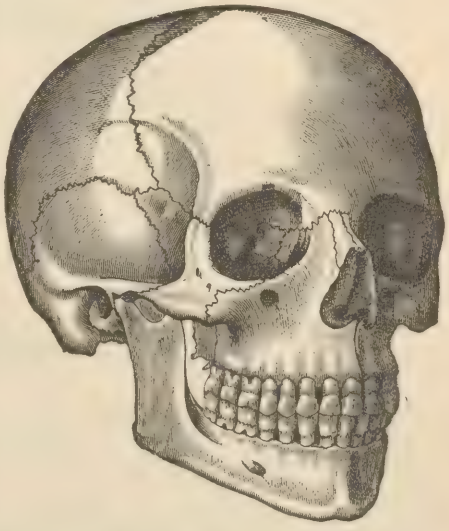


FIGURE 43.—Skull, showing the orbits or bony cavities which contain the eyes. At the bottom of the right orbit is seen the optic foramen.

The Eyeball.

The *Eyeball*, or *Globe* of the eye, lies in the front of the orbit and projects a little beyond the lower edge of that cavity. Its shape is best described as that of a spheroid, with a part of a smaller sphere projecting from the front of it, as is shown in Fig. 44. Its average diameters are: antero-posterior, about $\frac{95}{100}$ inch; vertical, about $\frac{90}{100}$ inch; transverse, about $\frac{92}{100}$ inch. Its weight is $1\frac{1}{2}$ to 2 drachms, and its volume is about $\frac{1}{3}$ cubic inch. The centre of the anterior part (the *cornea*) of the eyeball is called *the anterior pole* of the eye. The centre of the posterior part is *the posterior pole.* A line running through the eyeball from pole to pole is called *the optic axis.*

Externally, is the wall or capsule of the globe, which is usually described as made up of three different layers, the whole being about one-sixteenth of an inch thick at the thickest part, which lies posteriorly. These layers are called the *investing membranes*, or *tunics*, or *coats* of the eyeball. The hollow globe thus formed is filled by materials of a fluid and gelatinous consistency which are known as *the humors of the eye.* The following are the names of the investing membranes, passing from without inward:

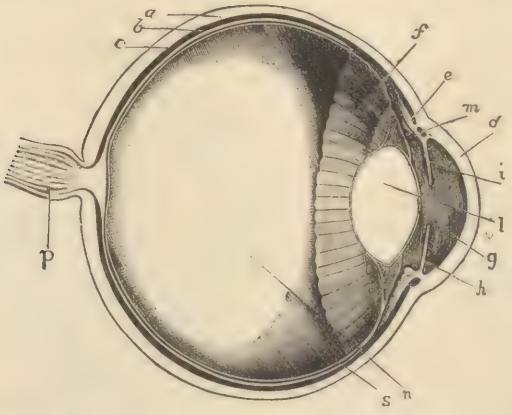


FIGURE 44.—Diagram of a vertical section of the eyeball: *a*, sclerotic; *b*, choroid; *c*, retina; *d*, cornea; *e*, ciliary muscle; *f*, ciliary processes; *g*, anterior chamber; *h*, posterior chamber; *i*, iris; *l*, lens, in its capsule; *m*, suspensory ligament of lens, or zonula of Zinn; *n*, space occupied by vitreous humor; *p*, optic nerve; *s*, location of ora serrata.

(1) *The Sclerotic and Cornea;* (2) *The Uveal Tract*, which comprises the *choroid membrane, the ciliary body*, and *the iris;* (3) *The Retina.* The first is called the *fibrous* layer, the second the *vascular* layer, and the third the *nervous* or *perceptive* layer.

The humors are called: (1) *The Aqueous;* (2) *The Crystalline,* also called *the lens,* and (3) *The Vitreous.* (See Fig. 44.)

The outermost tunic of the eyeball, called the *Sclerotic* (from the Greek σκληρα, *hard*), is really composed of *two* different membranes, as may be seen by Fig. 44. One of the membranes, constituting the posterior five-sixths of the tunic, is called *the sclerotic.* The other, forming the anterior one-sixth, is called *the cornea.* This tunic is the toughest of all, and serves to maintain the shape of the globe and to protect the parts within. It is the true *capsule* of the globe, as the other so-called tunics are very delicate and are rather designed for the purposes of sight. The sclerotic is pierced behind by a roundish opening, about one-twelfth of an inch in diameter, for the entrance of the optic nerve. (See Fig. 44.) Its anterior portion can be plainly seen, and is known as "the white of the eye." This part is covered by a glossy membrane called *the conjunctiva.* (See p. 231.)

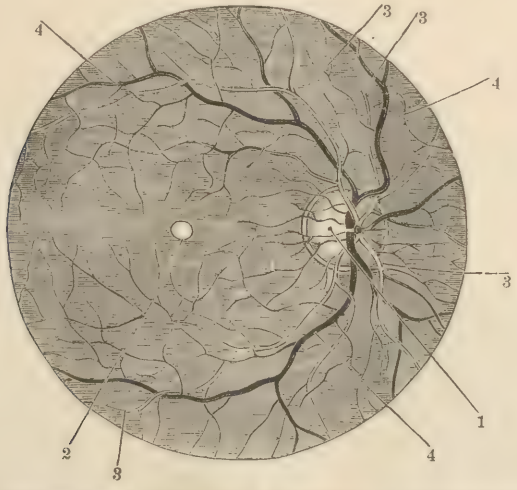


FIGURE 45.—1, Optic papilla; 2, yellow spot; 3, arteries; 4, veins—as seen on looking into the eye with an ophthalmoscope.

The remainder (the anterior one-sixth) of the outer tunic is called *the cornea* (from the Latin, *cornu,* a horn). It is also a firm, tough membrane, but, unlike the sclerotic, it is transparent, so as to permit light to enter the eye. It has a beautiful, clear, glistening appearance, and is aptly termed "the window of the eye." It is more prominent than the surrounding sclerotic. If an eyeball is cut across, as in Fig. 44, the cornea is seen projecting

from the sclerotic in front, like a part of a smaller sphere engrafted upon a larger one. This prominence of the cornea can also be seen by looking at another's eye in profile. The edges of the sclerotic overlap the cornea a little, in front and behind, so that the latter is usually described as fitting into the sclerotic like a watch-crystal into its case. It must be remembered, however, that the two membranes, although so different in aspect, really form one continuous tissue, and cannot be separated, as the above comparison with the watch-crystal would seem to imply. The cornea contains nerves, but no blood-vessels, its nourishment being derived from the vessels of neighboring parts.

The next layer of the wall of the globe is called *the uveal tract* (from the Latin *uva*, a bunch of grapes). This name was probably given to it on account of the peculiar purplish color seen when the eye is cut open. The uveal tract is divided by anatomists into three parts, which, although continuous with one another, are quite different. These three parts are called respectively, *the choroid*, *the ciliary body*, and *the iris*.

The choroid membrane is the part of the uveal tract which lies furthest back. It covers the internal surface of the sclerotic as far forward as a line a little in front of the centre, or equator, of the globe. This imaginary boundary-line is called the *ora serrata*, or *serrated boundary*. (See Fig. 44.) The choroid is composed chiefly of a network of small blood-vessels. Mingled with these are pigmented cells (little cells containing a dark coloring-matter), and a few muscular fibres.

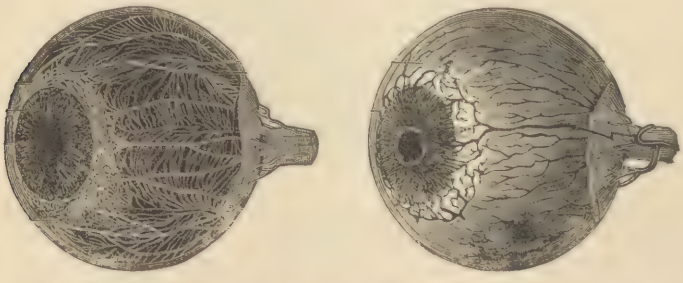


FIGURE 46.—The choroid coat as it appears after the sclerotic coat has been removed. Showing the arrangement of the blood-vessels, etc.

The ciliary body is the part of the uveal tract beginning at the ora serrata and extending forward to the iris. (See Fig. 44.) It is composed chiefly of the ciliary muscle, this being covered on its internal surface by a thin continuation of the choroid. The ciliary

muscle is a layer of muscular fibres, and has the form and position shown in Fig. 44. It is the muscle of *accommodation*, which will be found fully described on page 23. The choroid membrane which covers the internal surface of the ciliary muscle is thrown into seventy or eighty parallel folds, running from before backward, and forming a plaited zone like a lady's ruffle. These folds are called *the ciliary processes.* It may be seen from Fig. 44, that the ciliary muscle and processes form a complete circle or collar about one-eighth of an inch wide, which runs around the interior of the eyeball just behind the edge of the cornea. The region corresponding to this circlet is called *the ciliary region* of the eyeball, and is of very great importance in diseases and injuries of the eye, as they are specially dangerous in this locality.

The iris (Latin, *iris*, rainbow) is the part of the uveal tract lying in front of the ciliary body. By referring to Fig. 44 it will be seen that the membrane is now no longer in contact with the outer tunic, but is bent inward away from it, and hangs free in the interior of the globe. By looking into another's eye the iris is plainly seen hanging vertically, like a circular curtain, a short distance behind the cornea. It is, in fact, what is called "the colored part of the eye." A circular hole is left in the centre of the iris, which is called "the pupil of the eye," and it usually appears jet-black.* The posterior surface of the iris is covered by a layer of pigmented cells. The iris contains muscular fibres whose office is to alter the size of the pupil. The movements of the pupil are largely reflex—that is, occurring without our knowledge or will, but simply from the effect of the light which enters the eye. If the eye is exposed to a bright light, the pupil contracts so as to lessen the amount admitted within the eye; if exposed to a dim light, the pupil dilates so as to admit more. The pupil likewise varies in size in the accommodation and convergence of the eye, independently of the amount of light (p. 237). The iris also contains blood-vessels and nerves. Besides the layer of pigment on the posterior surface of the iris, which is designed to prevent the light from shining through it into the eye, there are other pigmented cells in the superficial parts of the membrane. It is

* The reason why the pupil of another's eye looks black to us is this: The interior of the eye would appear illuminated, if at all, by reason of the light which had entered the eye being reflected back again to us. Some of the light is so reflected, but these reflected rays, in coming out from the eye through the pupil, retrace precisely the same path by which they entered. Hence, we cannot place our eye in their path without putting our head between the observed eye and the source of light, and so cutting off the illumination. This difficulty is overcome by an instrument called the ophthalmoscope, by means of which the interior of the eye can be seen through the pupil.

chiefly these latter which cause the beautiful colors seen in the iris. The different colors of eyes, however, are not so much due to differently-colored pigment in the iris as to different quantities of the same pigment. Thus in light eyes there is very little; in dark eyes there is more, according to the shade of color. The same conditions prevail to a less extent throughout the rest of the uveal tract. As a rule, the eyes of children at birth are light, and, if they are to be dark, they become so gradually, by the deposit of pigment in the iris as the child grows older. In the albino, pigment is almost entirely absent from all parts of the eye, as well as from the hair, skin, etc.

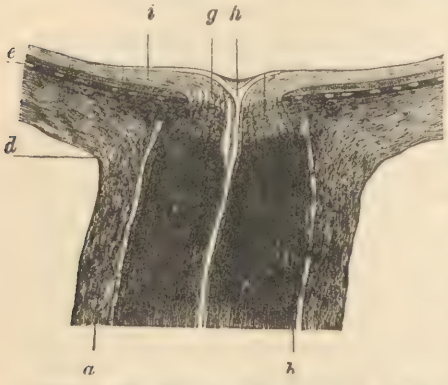


FIGURE 47.—Showing the entrance of the optic nerve into the eye and the spreading of its fibres into the retina: *a*, sheath of optic nerve; *b*, optic nerve; *d*, sclerotic; *g*, optic nerve filaments spreading into retina; *i*, the retina; *h*, location of the central artery.

Internal to the choroid, and attached to it, is the *retina*, which is the innermost layer of the wall of the globe. It extends forward only to the *ora serrata*, which was described on page 224. (See Fig. 44.) It is very delicate and quite translucent, and is composed chiefly of nerve-tissue designed to receive the images of external objects which are formed within the eye. (See page 236.) When viewed under a microscope it is seen to be composed of several

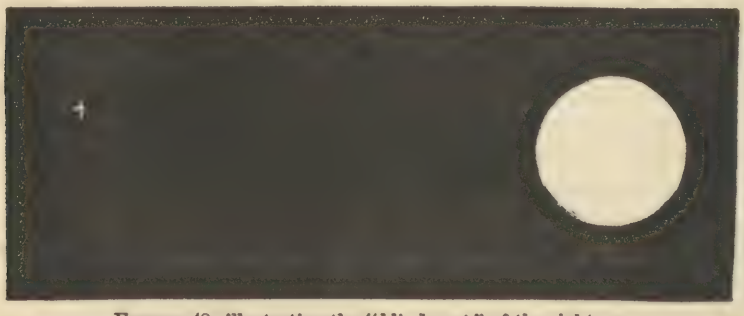


FIGURE 48, illustrating the "blind spot" of the right eye.

different layers. One of these layers of the retina is formed by an expansion of the optic nerve after it has pierced through the capsule of the globe. The nerve-fibres bend over the edges of the opening in the capsule, and radiate into the retina in all directions. Strangely enough, these fibres are not sensitive to light—that is,

when light enters the eye they do not perceive it at all. The point of entrance of the optic nerve itself, *the optic papilla*, forms a blind spot of corresponding size in our field of view. This is called *the blind spot of Mariotte*, after the man who first described it. Its existence can be proved by the following simple experiment: On a sheet of paper draw a small cross, and, three or four inches to the right of this, make a dot about half an inch in diameter. Hold this paper in front of the right eye, and, with the other eye covered, look *steadfastly* at the cross. By moving the paper backward and forward a point will be found where the dot will disappear from view entirely. The reason of this is, that under the above conditions the image of the dot falls exactly upon the optic papilla; and, as it is not perceived, the experiment shows that the papilla is really a blind spot. Because the optic nerve-entrance is not at the centre of the eyeball, the blind spot does not fall directly in our line of vision—that is, in the centre of our field of view. Hence it occasions no inconvenience, and centuries elapsed before it was even discovered.

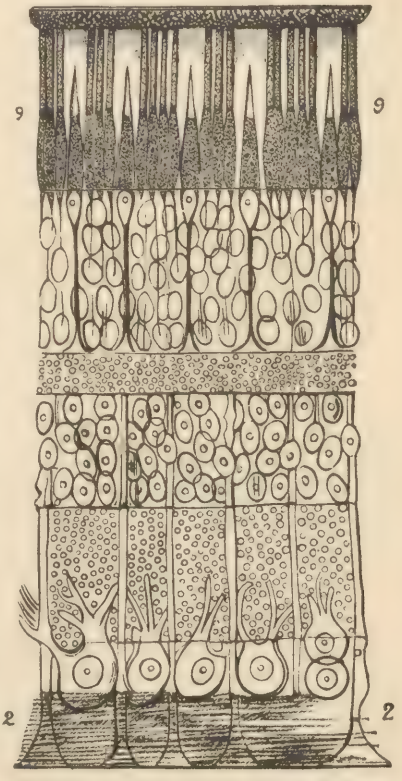


FIGURE 49.—Showing the layers of the retina, largely magnified; No. 2 shows the layer of optic nerve fibres; No. 9, the layer of rods and cones.

One portion of the retina is known as the layer of "rods and cones," from the peculiar shape of the elements composing it. This layer is almost universally considered as the true *perceptive* layer of the retina. This view is thought to agree best with anatomical facts and with the results of experiments. It is assumed that, in accurate vision, the image of the object is formed exactly in this layer of the retina (page 236).

There is one point of the retina which is of great importance, and that is the *macula lutea*, or *yellow spot*. This is a region about $\frac{1}{25}$ to $\frac{1}{17}$ inch in diameter, and situated about $\frac{1}{12}$ to $\frac{1}{10}$ inch to the outer side of the optic papilla. (See Fig. 45.) In its centre is a little

pit or excavation called the *fovea centralis.* This spot is the centre of direct vision ; that is, it is the part of the retina most sensitive to light and color, and the part which is always turned toward the object looked at. From this point the sensitiveness of the retina grows less and less in all directions. The blood-vessels which enter the eyeball through the centre of the optic nerve (see p. 229) branch into the retina in all directions. There are no vessels whatever in the *fovea centralis.* There is a layer of beautiful hexagonal, pigmented cells on the side of the retina next to the choroid. (See Fig. 50.) This pigmented layer of the retina is continued forward over the internal surface of the ciliary body and of the iris. It is of great importance for vision to have the interior of the chamber of the eyeball thus darkened (p. 234).

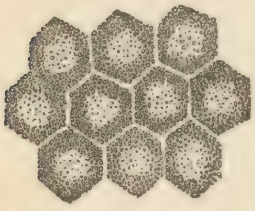


FIGURE 50.—Pigmented cells from the human retina, surface view, largely magnified.

The *aqueous humor* is a transparent, watery fluid, filling the spaces indicated in Fig. 44 by *g* and *h.* The space marked *g* is called the *anterior chamber* of the eye. The space marked *h* is called the *posterior chamber.* If the eye is looked at from one side, the anterior chamber (see Fig. 44) can be seen as the space between the cornea and the iris.

The *Crystalline humor* or *Lens* is a transparent, elastic, biconvex body looking like an ordinary glass magnifying-lens. It is of circular outline, about $\frac{9}{25}$ inch in diameter. It is of quite firm consistence. It is enclosed in a transparent, elastic capsule (about $\frac{1}{2000}$ inch thick), and is suspended by a ligament just behind the iris, so that it lies about one-seventh of an inch back from the cornea. (See Fig. 44.) It contains no vessels or nerves, and absorbs its nourishment from surrounding parts. The suspensory ligament of the lens is called the *zonula of Zinn* (Latin, *zonula,* a little girdle).

The *vitreous humor,* or *hyaloid body* (Latin, *vitreum,* glass; Greek, ὑαλος, glass), fills the interior of the eyeball behind the lens. (Fig. 44.) It is a transparent, colorless, gelatinous substance, looking like liquid glass. It contains no blood-vessels, and absorbs its nourishment from the walls of the globe. A good idea of the vitreous humor and crystalline lens can be very easily obtained by cutting open the eye of a pig or a sheep. Much can be learned about other parts of the human eye in the same way. Eyes of animals can be obtained from any butcher.

The Optic Nerves.

The *Optic Nerves* are the nerves of the special sense of sight, and connect the eyeballs with the brain. (See Fig. 51.) They have their origin in the base of the brain. These nerves enter the orbits through the optic foramina, and, running forward, each nerve passes into its corresponding eye a little to the inner side and a little below the posterior pole of the globe. After penetrating the wall of the globe the nerve-fibres spread out into the retina in all directions, forming one layer of that membrane. (See p. 227.) At its point of entrance the nerve projects into the eye a little beyond the level of the internal surface of the wall of the globe, forming a round or oval prominence called the *optic papilla* or *optic disc*. (See Fig. 45.) As soon as the nerve-fibres leave the disc to branch into the retina they become transparent. Hence, in looking into an eye with the ophthalmoscope, the nerve-fibres cannot be seen bending over from the disc into the retina. The disc alone is visible, looking like a round, whitish spot, and the appearance is as if the nerve had been cut off short at that point. (See Fig. 45.) A main artery, called *the central artery of the retina*, enters the nerve about four-fifths of an inch behind the eyeball and runs forward in the centre of it. At the optic disc it divides into several branches, which bend over the edges of the disc and radiate into the retina. The *central vein* accompanies the artery in its course and conveys part of the blood out from the eye.

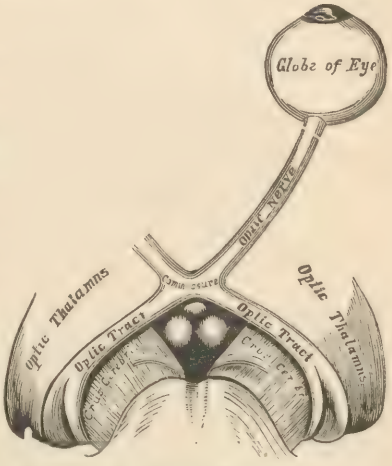


FIGURE 51.—Base of brain and course of the optic nerves.

The Appendages of the Eye.

The eyeball is moved by six muscles. These start from the walls of the orbit, and are attached to the outer or sclerotic coat of the eyeball. Four of the muscles are called the *recti* muscles, from their straight course. The other two are called the oblique muscles. (See Fig. 52.) The names of the muscles are the *superior rectus*, the *inferior rectus*, the *external rectus*, the *internal rectus*, the *superior oblique*, and the *inferior oblique*.

The eyeball, excepting its most anterior portion, is surrounded by a membranous capsule (called Bonnet's and Tenon's capsule), through which the muscles penetrate just before becoming at-

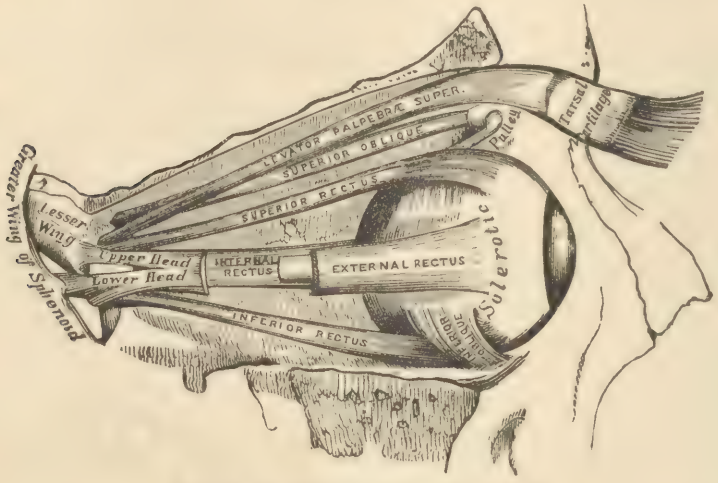


FIGURE 52.—Muscles of the right eyeball.

tached to the sclerotic. The eyeball rotates freely in this socket, and its movements are facilitated by this arrangement.

The *eyelids* (or, in Latin the *palpebræ*) are the two protecting curtains placed in front of the eyeball. They are movable, and can be opened and closed at will, as in the so-called *opening* and *shutting* of the eyes. They also move independently of the will, as when a particle of dust strikes the eye, or, upon sudden exposure to a bright light, etc. This involuntary action of the lids protects the eyes from many unexpected dangers. The slit between the edges of the lids is called by anatomists the *palpebral fissure.* It is chiefly the size of this fissure which causes the appearance of large and small eyes, as the size of the globe itself varies but little. The outer corner of this fissure (the corner towards the temple) is called the *external canthus.* The inner corner is the *internal canthus.* (See Fig. 53.)

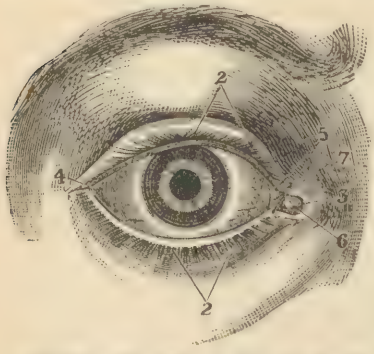


FIGURE 53.—The eyelids: 2, 2, cilia or eyelashes; 3, inner canthus; 4, outer canthus; 5, puncta lachrymalia; 6, caruncular lachrymalis; 7, semilunar fold.

The lids are composed of several different substances. (See

Figs. 13 and 14.) Outside is the skin, which is a continuation of the skin of the rest of the body. At the edge of the lid the skin grows thinner and passes into a mucous membrane, just as the skin about the mouth passes into the mucous membrane of the lips. This mucous membrane is called the *conjunctiva* (Latin, *conjungere*, to join together), and it lines the inner surfaces of the lids, and passes thence over upon the front of the eyeball, covering the sclerotic as far as the edge of the cornea, where it ends.* (See Fig. 54.) This folding over of the conjunctiva from the upper and lower lids upon the eyeball constitutes what are called the *superior* and *inferior conjunctival folds;* also called the *retrotarsal* or *palpebral folds.* The little pouches thus formed above and below are called respectively the *superior* and *inferior conjunctival culs-de-sac.* (See Fig. 54.) A crescentic fold of conjunctiva can

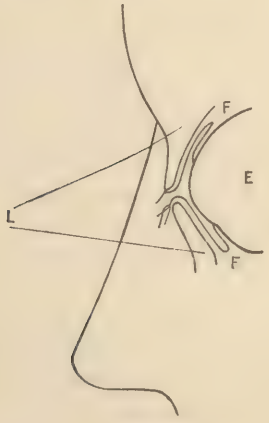
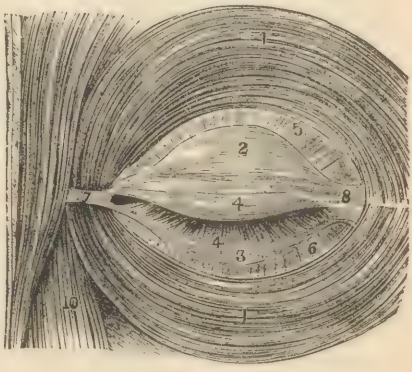


FIG. 54.



IG. 55.

FIGURE 54.—Vertical section of the upper and lower conjunctival folds: *e*, eyeball; *l*, eyelids; the fine lines within the lids represent the conjunctiva covering the inner surfaces of the lids and reflected upon anterior surface of globe, forming *palpebral folds*, and conjunctival *culs-de-sac* at *ff*. Lids drawn away from eyeball to show conjunctiva.

FIGURE 55.—1, 1, the orbicularis muscle which closes the eyelids; 2, the cartilage of the upper lid; 3, cartilage of the lower lid; 4, 4, edges of the lids.

also be seen on the front of the eyeball at the inner corner of the lids. This is called the *semilunar fold,* or *plica semilunaris.* The conjunctiva covering the front of the eyeball (*the ocular conjunctiva*) is thin, and is very loosely attached. The conjunctiva also dips down into the little glands of the lids, forming a lining for them, and also lines the lachrymal passages, becoming thus con-

* A very delicate prolongation of the conjunctiva, consisting of minute cells, passes over the front of the cornea.

tinuous with the mucous membrane of the nose and mouth (p. 233).

Between the skin on the outside and the conjunctiva on the inside are enclosed the other structures of the lids. Just beneath the skin is a layer of muscular fibres, a part of the *orbicularis** muscle. (See Fig. 55.) It is what is called a *sphincter* muscle (*Greek*, σφιγγω, *to constrict*), and its action is to close the lids. There is another muscle, whose office it is to lift the upper lid, called the *levator palpebræ superioris muscle.* (Fig. 52.)

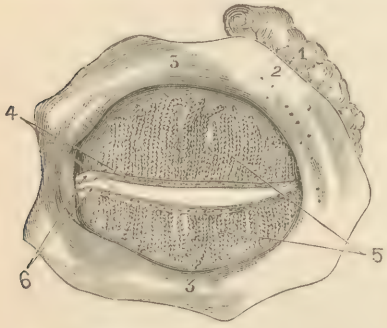


FIGURE 56.—Showing a portion of the eyelids as seen from within: 1, Lachrymal gland; 2, openings of the lachrymal ducts; 3, 3, conjunctiva lining the eyelids; 4, openings of the Meibomian glands; 5, Meibomian glands; 6, puncta lachrymalia.

Beneath the orbicularis muscle is the piece of cartilage which forms the framework, as it were, of the lid. In the cartilages lie the *Meibomian glands*, so called after the anatomist Meibomius. (See Fig. 56 adjoining.) They furnish an oily secretion, which lubricates the edges of the lids and prevents their sticking together. This greasing of the edges of the lids also tends to prevent the tears from running over upon the cheek. Beneath the cartilage lies the conjunctiva, which has already been described.

The eyelashes or *cilia* (Latin, *cilium*, an eyelash) are the rows of short, thick hairs on the edges of the lids. Those of the upper lid curve upward, and those of the lower lid downward—an arrangement which keeps them from interfering with vision, and from interlocking when the lids are closed. They serve both for protection and ornament.

The small red body seen lying upon the semilunar fold at the inner corner of the palpebral fissure is called the *lachrymal caruncle.*

The Lachrymal Apparatus.

The *lachrymal* (Latin, *lacryma*, a tear), or *tear-apparatus* of the eye, consists of the *lachrymal glands*, in which the tears are formed, and of the *lachrymal passages*, which are designed to conduct the tears away from the eye after they have served their purpose. The largest lachrymal gland is situated just above the eye-

* Latin, for circular.

ball, in the outer corner of the orbit, as shown in Fig. 56. Below this there are a number of small glands lying in the upper fold of the conjunctiva, and called *accessory lachrymal glands.* The openings of the ducts, by which the tears escape from the glands, also lie in the same fold.

The lachrymal passages are shown in Fig. 57. If the lids are looked at closely, a slight prominence can be seen on the edge of each, about one-fifth of an inch from the inner corner. On still closer examination, each of these prominences can be seen to contain in its centre a minute hole, about the size of a pin-hole. This hole can be most easily seen in the lower lid by pulling the lid down a little with the finger, so as to roll its edge outward. Each of the prominences is called a *lachrymal papilla.* Each of the holes is called a *lachrymal punctum* (Latin, *punctum,* a small hole), and is the entrance to a little canal, called a *lachrymal canaliculus* (Latin, *canaliculus,* a little channel). These canals are about one-quarter to one-third of an inch long, and about one twenty-fifth of an inch in diameter, and run horizontally along the edge of the lid toward the nose to empty into the lachrymal sac. The *lachrymal sac* lies in the inner corner of the orbit, just behind the inner corner of the lids. It is a hollow, membranous sac, of oval shape, about two-fifths of an inch long, and one-sixth of an inch wide. Below, it opens into the nasal duct. (Fig. 57.)

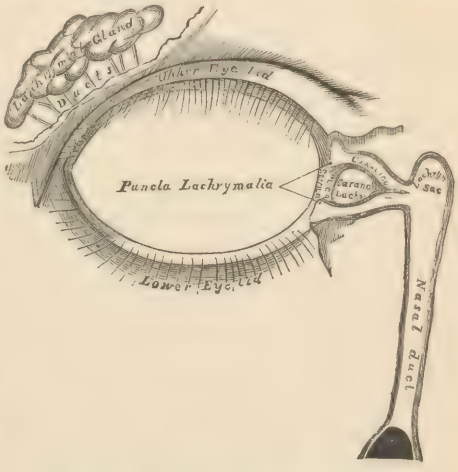


FIGURE 57.—Lachrymal apparatus.

The nasal duct is a bony canal, lined by mucous membrane, and running from the lachrymal sac downward, to empty into the lower part of the nose. It is three-quarters to four-fifths of an inch long, and about one-eighth of an inch in diameter. (Fig. 57.)

The *tears* consist of water containing a little salt and albumen. They are formed in the lachrymal glands, from which they escape by the little openings in the upper conjunctival fold (page 231). They are constantly spread over the front of the eyeball by the winking of the lids, and serve to keep it moist and lubricated. If deprived of this moisture the cornea would become dull and opaque. Any

excess of tears finds its way to the inner corner of the lids, and is taken up by the puncta, and so passes through the canaliculi, sac, and duct, into the nose. Aside from the usual flow of tears, there is a special flow of them caused by any irritation of the eye, or by certain mental states, as of grief. If a particle of dust flies into the eye, there is an extra flow of tears at once, and this tends to wash the foreign substance out again before it can do harm. The tears occasioned by irritation, grief, etc., are so abundant, that they may be felt running down into the nose, and those which cannot escape in this way flow over the cheek. Under ordinary circumstances, most of the tears evaporate, scarcely any passing into the nose. If the secretion of tears were entirely suspended, the resulting dryness of the eyeball would lead ultimately to its destruction for purposes of vision.

The *eyebrows*, or *supercilia* (Latin, *supercilium*, an eyebrow), are the arched elevations of skin and underlying tissue around the upper edges of the orbits. They are covered by a row of short hairs, which are directed toward the temples. They serve to protect the eyes, shielding them from bright light, from the perspiration of the forehead, etc.

After the foregoing general sketch of the anatomy of the eye the reader will more readily understand a few remarks upon *vision*.

THE PHENOMENA OF VISION.

The eyeball is often compared to a photographer's camera, and the comparison is a very just and convenient one. It is essentially a hollow, spherical box, filled with fluids, having its interior surfaces darkened by black pigment, and containing a system of lenses by which images can be formed, and a screen upon which they can be received. In front is a diaphragm (the *iris*), with a variable central aperture (the *pupil*) to regulate the amount of light admitted. All this is much like the apparatus used in taking a photograph. Some recent investigations might tempt us to push the comparison still further. Franz Boll, of Rome, Italy, has found that the layer of rods and cones of the retina (page 227) possesses a beautiful purplish coloring, which is destroyed by the action of light upon it, and constantly renewed again (during life) from the layer of pigmented cells beneath. This coloring is called *the purple of the retina*, or *the sight-purple*. Kühne, of Heidelberg, has investigated this subject very thoroughly, and has performed many experiments upon it, of which the following will serve as an example: A rabbit was placed a short distance from a window and its head covered with a black cloth. The cloth was then removed and

the rabbit's eye exposed to the light of midday for a few minutes. The animal was then beheaded, and the eye removed and preserved, with the usual precautions. On taking out the retina, it was found to exhibit an accurate photograph of the window, its panes white, and its sashes purplish-red. Many other experiments gave similar results. From all this we might conclude that the retina is a sensitized plate, placed at the back of the eye, like that which the photographer slips into his camera before taking a picture; that the sensitive surface of the plate (*the sight-purple*) is worn out by the action of light in forming the images, and constantly renewed again by the wonderful chemistry of the body; that the eyeball is not only like a camera obscura, but like a complete photographic establishment. At present, however, such conclusions would be premature, for the facts regarding the retinal purple are not fully determined, especially in the human eye; and, although the experiments upon it have given such striking results, it is not yet proven to be essential to sight.

Although the eye contains only one *lens* so-called, yet the cornea and the aqueous and vitreous humors also bend the rays of light passing through them, and thus there is really a series of convex surfaces, which together form a compound, convex lens. These are technically called *the refracting surfaces of the eye.* It is very convenient, in description, to speak of *the lens of the eye,* and the expression is proper enough if the above facts are only borne in mind.

Now, as is well known, convex lenses have the power of causing the rays of light which pass through them to converge to a point, or *to come to a focus,* as it is called. It is on this account that they are able to form *images* of objects. Place a lighted candle a few feet from a white wall, and hold a strong convex lens * vertically, in a direct line with the flame and between it and the wall. Then move the lens backward and forward in a line with the flame, and a point will be found where a distinct image of the flame will be formed upon the wall. An image can be formed of any luminous object in the same way. The image will be found to be smaller than the object, and upside down. The image is formed, because the rays of light coming from every point of the object are made to unite in corresponding points behind the lens by passing through the latter. The image is inverted, because the rays, in passing through the lens, cross each other—that is, those coming from the top of the object go to the bottom of the image, etc. (See Fig. 58.)

* One of three or four inches focus.

Now, the rays of light which enter the eye from external objects are converged by its compound lens in exactly the same manner. All that is required to produce a clear image on the screen (or retina) at the back of the eye, is to have the proper relative distances between the object, the lens, and the retina, just as in the case of the candle, the glass lens, and the wall. In the normal eye these conditions are fulfilled in the act of vision. By laying bare the retina at the back part of the eye in animals, experimenters have seen the inverted images of external objects formed there

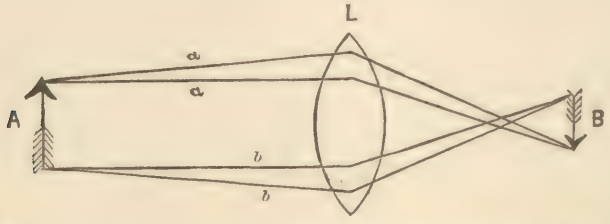


FIGURE 58.—L, the lens; A, object; *aa*, *bb*, rays of light from two points of object; B, image.

Returning to the experiment with the candle: as soon as the image on the wall is distinct, fix the lens in its position. Then, if the candle-flame is moved—if, for instance, it is carried nearer to the lens—the image on the wall will immediately become blurred. To get a distinct image again under these new conditions, the lens must be moved to another point, or must be replaced by one of different power. In the camera obscura the lens can be moved back and forth, so as to form a clear image, whatever the distance of the object. In the eye, however, the distance between the lens and the retina (the retina here representing the white wall in the experiment) may be said to be unalterable. Hence, as the eye is required to see objects at all distances, it must possess the faculty of changing the strength of its lens accordingly. Without this faculty, the image on the retina could be distinct only within very

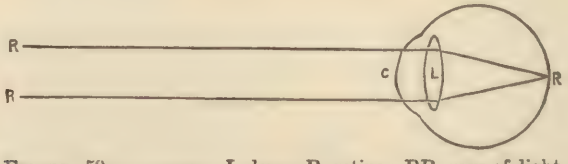


FIGURE 59.—*c*, cornea; L, lens; R, retina; RR, rays of light.

narrow limits. The eye really has this power, called its *power of adjustment*, or of *accommodation*. It is required chiefly for vision of objects at short distances. As soon as objects are brought near

to the eye, the rays of light from them become more divergent, so that they cannot be brought to a focus by the lens so quickly.

Fig. 59 represents two rays of light entering the eye from a given point of a distant object.* It will be seen that they are united in a point exactly on the retina.

Fig. 60 represents two rays coming from a point of a near object. It will be seen that they are more divergent. Hence, they cannot be brought to a focus so quickly. If not interrupted in

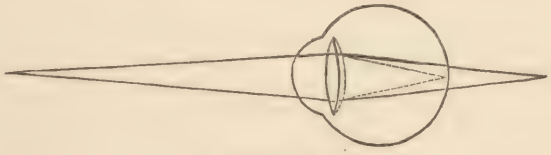


FIGURE 60.

their course, they would be united in a point behind the retina, as shown in the figure. In order to unite these rays on the retina, the lens must become thicker—that is, its converging power must be increased. This is actually done through the faculty of *accommodation*, and this is what that term means. The change is shown in the figure by the dotted lines. The nearer the object, the more divergent the rays from it, and the thicker must the lens become to keep the focus in the retina. As the object recedes from the eye, the lens must become weaker again, which it does by becoming flatter—less strongly curved. All these changes in the lens are accomplished through the action of the ciliary muscle, which is the muscle of accommodation; and they take place usually without any conscious effort on our part. During the act of accommodation the pupil contracts, so that the diverging rays from the near object are allowed to pass only through the central part of the lens, and thus the image on the retina is more distinct than it would be otherwise.† If one looks at his own eye in a mirror, and brings the mirror gradually nearer to his eye, he will see this contraction of the pupil take place.

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* In the ideal eye the distance between the lens and the retina is such that rays of light, which are parallel when they enter the eye, are exactly focussed in the retina. It is found that all rays from distances greater than twenty feet are so slightly divergent that they may be regarded as practically parallel. Hence, the perfect eye sees objects at all such distances without the use of its faculty of accommodation. This form of eye is comparatively rare.

† Because the spherical aberration of the lens is thus lessened. The lens is so constructed that its density decreases from the centre toward the periphery, and this also tends to lessen its spherical aberration.

In describing the retina (page 226), it was shown that the macula lutea, or yellow spot, was the most sensitive part of it, both as regards light and color, and the part always directed toward the object of sight—*the centre of direct vision,* as it is called.*

A single trial will show that, in looking at an object, only a small part of it is seen *distinctly* at one time. The surrounding parts are seen, but they appear blurred. This is because the image of these parts falls on portions outside of this most sensitive point—the macula. (See page 227.) Hold the accompanying circle (Fig. 61) about eight inches away, and look at it with one eye, the other being closed. It will be found that the words in the centre and the words in the margin cannot be read *at the same instant.* When the words in the centre can be seen *with perfect clearness,* those in the margin will appear blurred.

FIGURE 61.

As a compensation for this limitation of distinct vision, the eyeballs can be rotated by their muscles in every direction, so as to command a very extensive field of view. These movements are so rapid and so habitual, that most persons are not aware of the limitation named.

Impressions on the retina have a certain *duration,* which is estimated to be about one-third of a second. Many familiar experiments illustrate this fact. A lighted torch, revolved rapidly before the eye, gives the impression of a continuous circle of fire. In a rapidly revolving wheel, the spokes cannot be distinguished from each other. This duration of the impressions prevents vision from being interrupted by the winking of the lids.

The *color* of light is considered to be analogous to the *pitch* of sound. As the latter is determined by the number of vibrations of the atmosphere which strike the ear in a second, so the former depends on the number of waves of ether which strike the retina in a second. The lowest note of an ordinary musical scale has sixteen vibrations per second ; the highest has 20,000 per second. The number of ether-waves which strikes the retina *in a second* to produce the sensation of red (which lies at the bottom, so to

* An imaginary straight line, drawn through the refractive centre of the eye, from the yellow spot to the point looked at, is called the *visual line*, or the *visual axis*. It does not coincide with the optic axis (page 222), and must not be confounded with it.

speak, of our color-scale), is estimated at 474,439,680,000,000. The number required to cause the sensation of violet, which lies at the other extreme of our color-perception, is estimated at 699,000,000,000,000 *per second!*

The two eyes move in harmony with each other in such a way that the macula lutea of each retina is always directed to the point looked at—that is, the two visual lines meet in that point. An idea of these movements may be gained by watching another look at an object as it is approximated to the eyes. As the object is brought nearer, the eyes are turned in toward each other (or *converged*) more and more, so as to keep the two visual lines always directed to the point looked at, and thereby to cause an image always to fall on each macula.

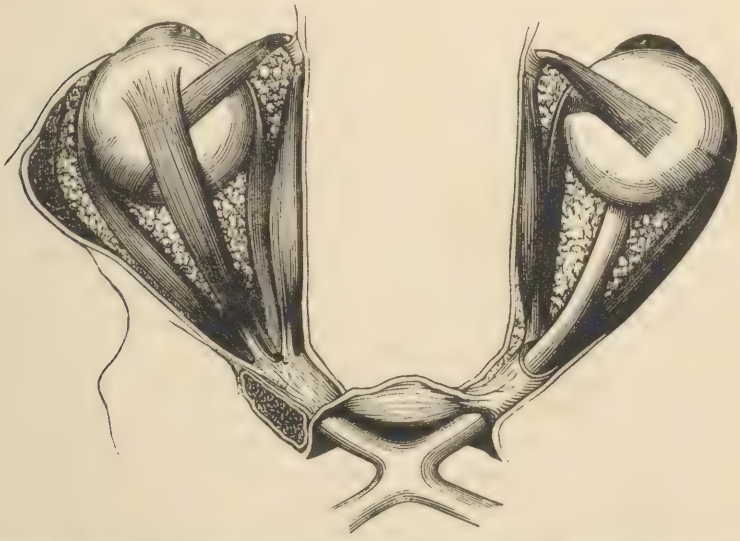

FIGURE 62.—Diagram of the eyes as seen from above, showing the muscular apparatus by means of which they are directed toward the same object.

It thus appears that in ordinary vision with both eyes, there is an inverted image of the object formed at the macula lutea of each retina. By means of the optic nerves, the impressions which these two inverted images make upon the retinæ are conveyed to the brain, and thence results a visual perception, the object appearing to us *single* and *erect.*

If one of the eyes is turned so that its macula lutea is not directed to the same point as that of the other eye, the two retinal images will not be united as usual, and the object will appear doubled. This double vision can very easily be caused if, when

looking at an object with both eyes, one of the eyes is made to deviate a little from its proper position by pressing against it with the finger—as by pushing it upward by pressure through the lower lid.

The phenomenon of single, erect vision from the two inverted retinal images has occasioned much discussion. Scientists have given explanations of it which seem plausible enough, but it can hardly be said that the matter is thoroughly understood. In speaking of the perception of *images* on the retina, it must be remembered that there is no proof that the mind takes cognizance of them, *as such*. We can only say that vision is the result of an irritation of the nerves of the special sense of sight, as hearing, smell, etc., are due to irritations of other special nerves. Whatever we may know of the formation of images on the retina, and of the changes which they excite there, the perception of these impressions by the brain must still seem mysterious to us.

It is a curious fact that sensations of light and of luminous objects can be excited where no light enters the eye, as by blows upon the eye, and by certain irritations in eyes which are totally blind.

In looking at an object near enough to require convergence of the eyes, the image of each eye differs considerably from that of its fellow. This can be readily seen by looking at a near object, and covering each eye alternately. The right eye will see more of the right side of the object, and the left eye more of the left side. It is the combination of these two different impressions that gives us our ideas of *solidity* and *depth*—what is called *the stereoscopic effect*. Otherwise, objects would appear unduly flat to us.

The muscular efforts required to direct both visual lines toward an object, and to see it distinctly, are the chief factors from which we unconsciously estimate the *distance* of an object. This is largely a matter of education and experience. If only one eye is used, it will be found much more difficult to judge of distance correctly.

In the brief outline of the physiology of vision given above, the writer has attempted to set forth only the leading facts in a clear and simple way. Many points connected with the subject have been left unmentioned, and some of them are of great interest. The reader who wishes to study the matter further, is referred to the standard text-books.

Considered as a mere optical instrument, the eye has several imperfections, which cannot be described here. It is admirably adapted, however, to the purposes for which it is designed, and is one of the most wonderful and beautiful organs of the body.

EDWARD T. ELY, M.D.

GENERAL REMARKS UPON THE CARE OF THE EYES.

In the section upon Diseases of the Eye, the writer has attempted to so describe them, that in case of the absence of competent medical advice, the reader may at least do no harm when compelled to undertake the care of these affections. He has also incidentally spoken of the precautions necessary to prevent sound eyes from becoming diseased. It may, perhaps, be well to preface the discussion of the latter subject with some general remarks, which may serve as a guide to parents and teachers, and to all those who have the responsibility of preventing injury to the vision of those under their charge.

Tired Eyes.

There is a popular notion that it is much more dangerous to tire the eyes by use than it is to tire any other organ of the body. It is not necessarily injurious to the legs, or the arms, or the brain to become tired, for proper rest may restore all these to their normal condition. The same is true in regard to the eyes. Proof-readers, sewing women, authors, and mechanics, who use their eyes for a long time upon near objects, must of necessity weary the muscles which adjust the eye to vision ; but if the weariness is compensated for by rest at proper intervals, there will be no harm done to the eyes, for they are so constructed that they can bear maximum fatigue as well as other parts of the body. Education would cease, all mechanical work would soon have an end, if the eyes of school-children and of a certain kind of workmen were never tired. Eyes are never overworked, even if they feel very tired when the task is done, if their natural power and freshness return after the proper intervals of rest during the day and sleep at night.

The Care of the Eyes in Childhood.

The eyes of children need more care than those of adults. As a general principle, intervals of rest between hours of close occupation with the eyes should be oftener and longer in children than in grown persons. The reason of this is, that the eyes of children are still in the course of development, and any organ which is yet to attain its full growth, requires more care in its use, longer and more frequent intervals of rest than one which has already reached its full size.

In a subsequent section I have dwelt at great length on the use of spectacles, and I need only say here that children whose eyes are not diseased, but which require glasses, should not abstain from using them, but should be provided with suitable spectacles, and then go on with their studies. Some of the most successful men and women the world has ever seen, have been successful from the knowledge obtained by the aid of glasses. The eye that needs a glass is not necessarily very much weaker—that is, much less capable of endurance—than one that does not.

Quality, Quantity, and the Point of Admission of Light.

All persons, whether young or old, should take great care with reference to the quality, and the point of admission of the light upon the object to be illuminated. Right-handed persons, if they sit with their right side toward the window while writing, reading, or sewing, necessarily obstruct much of the light which should fall upon the printed or manuscript page or work which is before them. For that reason, persons who use their eyes at work should endeavor, if right-handed, to have the light fall upon their left side, so that none of it will be obstructed by the right arm ; and for left-handed persons the situation should be reversed. A light that is in front of the worker is injurious, because it is dazzling. For the same reason, and also because the quantity is insufficient, a light over the head is injurious. Under all ordinary circumstances, light falling upon the side is the best.

Then there should be plenty of light. Reading in the twilight, reading by insufficient illumination, or by a flickering gaslight, produces injurious effects upon the eyes. It causes a strain on the muscles for exact vision. All strain that is continued for any considerable length of time is reflected injuriously upon the blood-vessels of the eye, and if upon the blood-vessels, it is upon what physicians call the nutrition of the eye—upon its health—for the blood-vessels are the great sources of repair of waste of tissue.

The Character of Type.

The character of type should be carefully considered, and parents and teachers should see to it that books which are printed from old and much worn plates, or with very small type, are rejected. Books abounding in fine foot-notes should not be used in schools. Books printed in the Greek language should be very carefully executed. This is also true of German text. It would, indeed, be a benefit to the world if the Germans would give up

their absurd characters and use the Latin ones, which are employed by English, American, French, and many other nations. The reason, of course, for avoiding type of this kind, which is not accurately and clearly formed, is that the effort necessary to see the words distinctly causes a strain upon the muscle inside of the eye, described on page 237, which adapts it to vision. A moderately wide page is less tiresome to the eyes than a very narrow one, because the changes in the position of the eyes are not so frequent in reading from broad pages as they are in reading from very narrow columns.

School-Houses.

The builders of school-houses have a great responsibility in arranging the desks for the pupils. The principle, as to light, which has just been laid down, should be carefully held in view. For, as I have said, it is the eye which is in the process of development that is peculiarly liable to be affected by improper or defective light. It is just as easy to arrange the desks so that the light comes in from the left side of the student as it is to place them otherwise.

FIGURE 63. — School-desk, showing the proper position for the book. The seat should be so arranged that the head need not be bent over, in order that the scholar may see distinctly.

The height of the desk is also important.* A short-sighted child should not be permitted to bend over his or her book. Indeed, no person should. It would be very well if, in large and well-regulated schools, there were a certain proportion of standing-desks to which pupils might be sent, in order to relieve their eyes from strain when bending their heads. At any rate, the head should never be bent so much that entrance of blood into the eye is very much favored, while its return is hindered. So far as possible the head should be kept in an erect position, in a line with the trunk, while study or any other close work with the eye is carried on.

The managers of country school-houses might so arrange things

* [The desk here represented is of English manufacture, and is arranged so that the back-rest may be adapted to different heights, and the seat may be raised or lowered or made to approach or recede from the desk, as the size of the occupant may require. —ED.]

that the grateful shade of trees could be near the windows, and thus temper the glare of the sun in summer and of the snow in winter. It is surprising that the common advantages of country life are not made more complete use of. A few trees, not too near the windows of a school-house, would be of great service to the eyes of the little students.

Atmospheric Conditions.

An atmosphere laden with smoke not only renders reading difficult, but is, of course, detrimental to the general condition of the eyes. It is much worse to attempt to read or sew in a smoky atmosphere than to be quiet, without occupation of the eyes, in the same locality.

Riding or driving in a very strong wind is sometimes very dangerous, at least for eyes which are inclined to any kind of congestion. Many accidents have been caused by the wind striking forcibly upon the delicate structure of the eye. For, it is to be remembered, that the invisible wind has a power which is as severe as a blow from a tangible object, and it may injure blood-vessels so as to give rise to bleeding from them that will do the eyes great harm. If obliged to ride or drive against a strong wind, most persons will do well to wear blue or smoke-colored glasses as a protection against its direct force. Men should at least wear broad-brimmed hats. It need hardly be said that acrid vapors of all kinds are injurious to the delicate structure of the eye, and every person should avoid them as carefully as he would refrain from keeping his eyes wide open in a dust-laden atmosphere. Broad-brimmed hats are a great protection from such influences as those just mentioned, as well as from the glare of the sun, especially in cities where it is reflected from the pavement so as to be extremely unpleasant.

Travellers in mountainous regions, where snow perhaps may lie and reflect the light injuriously, should also wear these protective glasses. Goggles, or glasses set in cases made of wire network, as has been said in the section relating to the different diseases of the eyes, are not suitable, because they keep the eyes too warm, and, although they afford protection, they tend to excite the very diseases they are designed to avert.

The light reflected from snow is a fertile source of injury to the eyes. Boys and girls while coasting, should have their eyes protected, the one by caps with broad visors, the other by hoods projecting a little in front of the face.

Reading in Railway Trains.

Thousands of people living in places which compel them to travel in the railway trains to and from cities in pursuit of their daily occupation, are exposed to injurious effects upon their eyes, from the fact that the railway carriages go rapidly through different kinds of light, and roll so unevenly that the object looked upon, such as a newspaper or book, cannot be held steadily. In order to see distinctly in a moving railway carriage, the eyes must act spasmodically, or, at any rate, change their focus often, and hence a constant strain of the muscles of the eye is produced. If people are wise enough to stop when they find their eyes fatigued, it is probable that much reading can be done in this manner without positive injury; but if they continue to read after fatigue and discomfort are experienced, they may expect most serious consequences.

Reading in Bed.

Reading in bed is apt to be injurious from a variety of causes. The position is usually nearly flat on the back, which is a bad one for reading, and the light is apt to be insufficient and inconvenient. Invalids are most apt to read in bed. Fatigue of the muscles of the eye is, of course, more easily induced in them than in strong persons. Women reclining during the menstrual period, or in the days after childbirth, should be especially careful. Children recovering from measles and scarlet fever, should be especially guarded against using their eyes with small toys, or by reading or writing when they are not fully well, and especially when they are not yet allowed out of bed.

The invalids most apt to be injuriously affected by use of the eyes upon near and fine objects, are those who have lost much blood, and who are weak from this cause, or who suffer from certain affections of the brain. These two classes of sick persons, even if they are up and about, should be guarded against any long-continued use of the eyes upon objects that must be held near them in order to see them distinctly, and from reading that which requires any considerable mental exertion.

Training the Eye to look at Distant Objects.

Those who have the care of young children and youth should give much attention to this subject, and practise their charges in looking at long distances. Shooting, archery, and the like amusements become valuable means for training eyes for distant vision,

and thus of preventing or lessening the elongation of the eyeball, which is the cause of near-sightedness. Such sports are as necessary for the development of eyes as are the common ones of ball-playing, cricket, hoople, and so forth, for the development of the legs and arms. It is probable that the immunity from near-sightedness which the British people enjoy as compared with the German nations, is due to the variety of out-of-door life which the former encourage in their young and old people.

Reading Music.

Those who read music are particularly liable to strain of the eyes, because exact vision is required to follow the notes. Persons who should wear glasses for reading will especially need them while reading music, and a particularly good light is necessary to avoid straining the eyes.

Blurring of Vision.

Those who are inclined to overrate their symptoms are especially liable to do so with reference to their eyes. Any reader, with the opinion that fatigue of the eyes is very dangerous, and who becomes anxious with regard to the condition of his or her eyes, may sometimes have his equanimity restored until proper authority can be consulted, by testing the fact as to whether the finest print can be seen distinctly, if even for only a few seconds. If it can be distinctly made out, even though it causes fatigue, the presumption is that the weakness of vision depends upon some cause which can be removed. In these cases it is not so much a loss of the power of seeing that has occurred, as of the ability to continue to use the eyes. Blurring of the sight, therefore, in cases in which distinct vision exists for a few seconds, is by no means so dangerous a symptom as the absolute inability to see small objects. The latter is always a warning to immediately seek good medical advice. The line must, therefore, be carefully drawn between tired eyes and eyes which are absolutely unable to see fine objects —to *make out*, as we say, very fine print or the like.

Oculists call the former condition weak sight, and the latter loss of sight. Glasses will often remedy weak sight, while they will do no good for loss of sight from disease.

Pain in the Eyeball.

What has been said with reference to blurring of vision, may also be said of pain referred to the eyeball. If such pain is less after rest of the eyes; if it is, for instance, less in the morning after a night's sleep; if it is *not attended by positive loss of vision*, it is probably like blurring, one of the symptoms of over-work of the eyes, or use of the eyes under improper conditions, such as the neglect of wearing glasses for correcting and improving the vision when they should be worn, or of their use with insufficient illumination, or an incorrect position of the body, and so forth.

Loss of Sight.

It is strange that many persons will allow their power of seeing to slip away from them without alarm, when they are actually unable to see objects which, a week before, they could see distinctly.

Every person who suspects serious trouble with his eyes, should test himself by objects of a kind and size, which he knows that he has formerly seen distinctly at a given distance, and if he finds that he cannot see those objects, he should certainly seek advice. But as has been said, mere pain, or mere blurring, without actual loss of vision, are not symptoms of as alarming a character as this inability to see certain objects that formerly were distinctly made out. The writer, in common with all medical men who see much of diseases of the eye, has seen so many cases of such marked self-deception in regard to the loss of sight, that he is unable to trust the patients' own opinions with regard to their visual power, but is always compelled to resort to an exact examination by means of so-called test-letters.

Test-Letters.

Oculists, for the purpose of testing the visual power of their patients, use a series of sentences, which begin with the finest type that is made, and increase in regular order until very large or coarse type is used. A specimen of these is given on the following pages. Besides, they also employ a series of single letters. The latter is a more valuable test. If the letters that are used at the bottom of page 249 can be distinctly seen at a distance of twenty feet, there can hardly be any loss of sight. If it cannot be, the patient may

simply require glasses. But if the finest print, of which the specimens are given on this page (No. 1), cannot be read at any distance or with any light, there is certainly some loss of normal vision. If it can be read fluently and yet there is fatigue afterward, it is probable that the affection, if any exist, can be relieved by glasses or by general treatment. If the finest type can be fluently read, but only when held nearer than six inches, it is probable that the patient is short-sighted, especially if the test-letters cannot be seen at twenty feet distance. If the patient hold the test-sentence "No. 1" farther than eight inches from his eye in order to read it, it is probable that he is far-sighted, especially if he can read the test-letters at twenty feet. The important facts to be remembered are:

I. That an ability to read the test-letters fluently when placed at a distance of twenty feet, and "No. 1" at eight inches, constitute normal vision.

II. Inability to read the letters at twenty feet, while "No. 1" of the test-sentences can be fluently read at a distance less than six inches, indicates short-sightedness.

III. Ability to read the letters at twenty feet, while the test-letters "No 1" cannot be read at all, or only when held more than eight inches from the eye, indicates far-sightedness.

IV. Ability to read both the letters and the sentences at the proper distance, followed by a sense of strain, means weakness of vision.

V. Inability to read either the letters at twenty feet, or the sentence "No. 1" at any distance, means loss of sight by disease. This loss may be estimated by noting the distance at which the letters may be made out, if at all, and the number of the test-sentences that can be read.

Jaeger's Test-Types.

No. 1.

When, in the course of human events, it becomes necessary for one people to dissolve the political bands which have connected them with another, and to assume, among the powers of the earth, the separate and equal situation to which the laws of nature, and of nature's God entitle them, a decent respect to the opinions of mankind requires that they should declare the causes which impel them to the separation.

We hold these truths to be self-evident—that all men are created equal; that they are endowed by their Creator with certain inalienable rights; that among these are life, liberty, and the pursuit of happiness. That, to secure these rights, governments are instituted among men, deriving their just powers from the consent of the governed; that, whenever any form of government becomes destructive of these

No. 2.

ends, it is the right of the people to alter or abolish it, and to institute a new government, laying its foundations on such principles, and organizing its powers in such form, as to them shall seem most likely to effect their safety and happiness. Prudence, indeed, will dictate that governments long established should not be changed for light and transient causes; and, accordingly, all experience hath shown that mankind are more disposed to suffer, while evils are sufferable, than to right themselves by abolishing the forms to which they are accustomed. But when a long train of abuses and usurpations, pursuing invariably the same object, evinces a design to reduce them under absolute despotism, it is their right, it is their duty, to throw off such government, and to provide new guards for their future security. Such has been the patient sufferance of these Colonies, and such is now the necessity which constrains them to alter their former

No. 3.

systems of government. The history of the present King of Great Britain, is a history of repeated injuries and usurpations, all having in direct object the establishment of an absolute tyranny over these States. To prove this, let facts be submitted to a candid world.

He has refused his assent to laws the most wholesome and necessary for the public good.

He has forbidden his governors to pass laws of immediate and pressing importance, unless suspended in their operations till his assent should be obtained; and, when so suspended, he has utterly neglected to attend to them.

No. 4.

He has refused to pass other laws for the accommodation of large districts of people, unless those people would relinquish the right of representation in the Legislature—a right inestimable to them, and formidable to tyrants only.

He has called together legislative bodies at places unusual, uncomfortable, and distant from the repository of their public records, for the sole purpose of fatiguing them into compliance with his measures.

He has dissolved representative houses repeatedly, for opposing, with manly firmness, his invasions on the rights of the people.

No. 5.

He has refused, for a long time after such dissolutions, to cause others to be elected, whereby the legislative powers, incapable of annihilation, have returned to the people at large for their exercise; the State remaining, in the meantime, exposed to all the dangers of invasions from without, and convulsions from within.

He has endeavored to prevent the population of these States; for that purpose obstructing the laws for the naturalization of foreigners; refusing to pass others to encourage their migration hither, and raising the conditions of new appropriations of lands.

No. 6.

He has obstructed the administration of justice, by refusing his assent to laws for establishing judiciary powers. He has made judges dependent on his will alone for the tenure of their offices, and the amount and payment of their salaries. He has erected a multitude of new offices, and sent hither swarms of officers to harass our people and eat out our substance. He has kept among us in times of peace, standing armies, without the consent of our legislatures. He has affected to render the military independent

No. 7.

of, and superior to the civil power. He has combined with others to subject us to a jurisdiction foreign to our constitutions, and unacknowledged by our laws, giving his assent to their acts of pretended legislation. For quartering large bodies of armed troops among us; for protecting them, by a mock trial, from punishment for any murders which they should commit on the inhabitants of these States; for cutting off our trade with all parts of the world; for imposing taxes on us without our

No. 8.

consent; for depriving us, in many cases, of the benefit of trial by jury; for transporting us beyond seas, to be tried for pretended offences; for abolishing the free system of English laws in a neighboring province, establishing therein an arbitrary government, and enlarging its boundaries, so as to render it at once an example and fit instrument for introducing the same absolute rule into these colonies; for taking away our charters, abolishing our most

Snellen's Test-Type. (No. 20.)

Floating Bodies before the Eyes of Persons with Good Vision.

Many persons are very much alarmed by the appearance in their field of vision, especially when looking toward the sky, but sometimes when looking upon the printed page, of objects somewhat like little rings of mucus or minute soap-bubbles. Many of these appearances are merely shadows cast upon the retina. These shadows are the result of a disturbed condition of the natural component parts of the vitreous humor. (See p. 228.) They are not dangerous; cannot be seen by the physician when he looks into the eye with the ophthalmoscope, and they are seen most frequently in the eyes of those persons who use their eyes continuously. Other floating bodies in the vitreous, which are really dangerous, may always be seen by the aid of the ophthalmoscope, and neither improved condition of the general health, nor increase of the general strength, will ever cause them to disappear. They consist of blood and coloring matter which have escaped into the vitreous as the result of severe inflammation of the back part of the eye.

The former are found in persons who see perfectly well, but who are somewhat annoyed by the appearance of the rings while at work. Such persons may, perhaps, be quieted by the assurance that if, in spite of such annoyance, they see distinctly throughout the entire field of vision, and if they can read the finest print, and no loss of the power of seeing objects at a distance has occurred, they need have no apprehension as to serious consequences resulting from them.

Influence upon the Eye produced by Habits of Life.

The habits of life influence the eyes very markedly. Not always, but in a large proportion of cases, men who smoke and drink habitually and excessively are very apt to suffer, not only from inflammation of the outer part of the eyes, but from more serious forms of disease of the nerve and the retina. The person who is intemperate in smoking or drinking will suffer from his eyes exactly as in other organs of his body. These habits cannot be indulged in with impunity, and because some people go through life almost as inebriates, and yet do not suffer as to their eyes, is no more an argument that these habits are not generally injurious, than it would be to say that war is not dangerous because many people have passed through severe battles without losing their lives. Excessive indulgence in venery, whether among the mar-

ried or the unmarried, is sometimes a source of muscular fatigue, and consequently of congestion of the eyes.

It should always be remembered that eyes are only—eyes. Men and women must not expect to be able to live on insufficient food, and labor twelve or fourteen hours daily, with scarcely any interruption, without sooner or later reaching the point at which their eyes are unable to do their work. There is no organ in the body which requires more attention to the general health, the condition of the skin, exercise in the open air, good food and proper habits in every respect, than the eye. The tissues of this organ are peculiarly sensitive to any general influence.

The constitutional diseases may and do often affect the eye. This subject has been fully discussed in the following sections. Such diseases are, measles, scarlet fever, small-pox, yellow fever, syphilis, rheumatism, diphtheria, lead-poisoning, and so forth.

Length of Time that Eyes may be Continuously Used.

It is very hard, if not impossible, to lay down exact rules on this point. Perhaps, however, it may be correctly said that children under seven years of age should not be forced to use their eyes continuously on small objects held near them, longer than a few minutes at a time. In short, they should not go to school before that age, unless it be that they may be permitted, after six years of age, to be taught by object-teaching, by the so-called *Kindergarten* system.

Between seven and fourteen, children should not use their eyes at reading, writing, sewing, and so forth, more than three hours a day. The time spent in reciting is not included in this. Young men and young women between the ages of fourteen and twenty-one ought to be able to learn all their lessons, write all their essays, practise all their music in a period of five hours a day for five days out of the seven. Correct habits of study, that is to say, earnest attention to the work in hand, without dawdling, will certainly enable most youth of ordinary capabilities to do all their hard study in less than five hours a day. As to grown men and women, it is well-nigh impossible, in the light of present knowledge, to correctly name the time that may be daily spent in the use of the eyes on near and small objects. Experience as to one's own capabilities, if regarded, will soon settle this question.

GENERAL REMARKS UPON THE CARE OF INFLAMED AND INJURED EYES.

In the various sections of the chapter upon the Diseases and Injuries of the Eye, a detailed account is given of the general rules of treatment, but a very few general remarks on the same subject may not be out of place here.

Darkening of Rooms.

One of the common mistakes of those who have not had much to do with the care of the eyes, is to say that inflamed or injured eyes often require a confinement in a dark room for a longer time than a few days. Whatever is necessary in the way of exclusion of light, except after surgical operations upon the eye, and in a limited number of cases of disease, can be attained by the use of light bandages or protective colored glasses.

The writer has seen several persons who have been very unwisely kept for months and years in very dark rooms on account of trouble with their eyes. There are no circumstances which will justify any such exclusion of light as this. The influence of the sun and the fresh air are just as necessary to the body when the patient is suffering from disease of the eyes, as when affected with disease of the lungs, and we must look with suspicion upon any advice which contemplates keeping any patient with an affection of the eyes in a very dark room for a long period of time. Light is the true stimulus of the eye, and even diseased eyes, in a large proportion of cases, are the better for this stimulus, the same as an injured limb at a certain stage of its recovery is the better for gentle, active, or passive exercise.

The writer has seen ludicrous instances of the confinement of patients suffering from trifling injuries and diseases of the eyes, in rooms from which every beam of light has been rigorously excluded, and he has also seen the sad ones, already alluded to, where the general health has been seriously undermined, by prolonged exclusion of the light from the eyes of patients who should have been allowed to go about in the air and sunlight.

Poultices and other Applications.

Any person who prescribes for an eye without a knowledge of its anatomy, incurs a serious responsibility. Yet thousands of people take this responsibility lightly upon themselves. One of the most dangerous remedies thus prescribed is a poultice.

Poultices have destroyed so many eyes that, although their baneful influence has been alluded to in discussing the different diseases of the eye, I must here speak of them. Poultices usually quiet pain, but their beneficial effect in this way is more than counterbalanced by their dangerous power of softening the delicate tissues to which they are applied. In case of doubt regarding an affection of the eyes, it is much better to be content with the simple rules for keeping them clean, for keeping them from the influence of dust, wind, smoke, and the like, and bathing them with cold or lukewarm water, at intervals, and then do nothing more. It is better, I say, to follow these rules than to run any risk by using any wash or application, no matter how beneficial it may seem to have been in some other cases.

When severe pain is experienced in the eyes, very hot water may be applied for five or ten minutes every hour or so, without danger. It should be used by "sopping" the eyes with very soft cloth which has been dipped in almost boiling water. The continuous application of moist heat to the eyes is very dangerous, because the transparent and very delicate front of the eye may be broken down by its application.

Cold water is often grateful and necessary for inflamed eyes. It may be applied continuously, if it is agreeable, but great care should be taken that it is not allowed to become warm upon the eyes. To avoid this, bits of soft cloth may be laid upon a block of ice and then upon the eyes. These applications should be changed every one, two, or three minutes, according to the heat of the eyelids. A "rose" attached to a water-pipe is another means of irrigating the eye with cold water. Douches for the eye that are worked by pressure upon an India-rubber air-bag, are also useful for the same purpose. Plunging the head under water, and then opening the eyes in it, seems a harsh method of washing the eyes. Many persons practise this. The experience of the writer seems to show that it produces no beneficial results that may not be obtained by a less disagreeable and less dangerous method.

Water that is slightly impregnated with salt, in the proportion of a teaspoonful to a quart, is usually a bland and useful application to eyes that readily redden and become catarrhal.

It is impossible to lay down any rules that will be sufficient for the care of any part of the human frame under all circumstances, but it is hoped that the foregoing will at least serve as a guide to those who may read them, and who are anxious to preserve their vision.

DISEASES OF THE EYE.

THE human eye is subject to numerous diseases, and it is also in quite a large proportion of cases so irregular in shape as to be only completely useful when aided by spectacles. Moreover, the exposures incident to the various employments of adult life, and to the amusements of childhood, very often inflict injuries upon it. It will be the object of this chapter to furnish some general but correct ideas as to the nature and treatment of the affections thus variously produced. For the sake of system and order in our study, the affections of the lids and of the tear apparatus will be first discussed, after which we may pass on to those of the eyeball.

Inflammation of the Edges of the Lids—Blepharitis Ciliaris.

The edges of the lids are sometimes red and covered by a thick secretion which lies in crusts about the roots of the lashes, and on the mouths of the little tubes that are found in the cartilage or dense portion of the lids. This condition of things may be neglected or not properly treated, and may go on to such an extent as to destroy the lashes and give the eyelids a very unsightly appearance. This affection is probably as old as the race. It is particularly liable to occur in hot, dry, and dusty countries.

The Bible describes Leah as "tender-eyed," but says of Rachel that she was beautiful and "well-favored." The "tender" eyes of Leah, judging from what the travellers say of the prevalence of inflammation of the edges of the lid in the East, were affected in the manner that has been described.

Causes.—These are chiefly to be found in a kind of catarrh caused by the presence of irritating substances upon the edges of the lids. Among the poorer classes dirt plays an important part in producing the disease. It is peculiarly apt to occur, as will be seen in the consideration of the use of spectacles, in persons whose eyes require glasses, but who do not wear them. Such eyes are constantly subject to a strain which may be compared to that undergone by any muscles that are working at a disadvantage, and which are attempting to do that for which their power is insufficient.

Treatment.—The necessity for perfect cleanliness of the part involved in the disease, is the first and last advice to be given in all external diseases of the eye in which there is an increase of the natural secretions or any formation of pus. Eyes affected with diseases of the roots of the lashes, or of the glands at the edges of the lids, are best cleansed in the following manner:

A teaspoonful of ordinary baking-soda is dissolved in about a pint of warm water. Then the eye to be washed should be gently closed, and if the patient be a grown person the washing is done with his own hand by means of small bits of an old cambric handkerchief or similar material. If crusts are upon the lids, this washing will require some rubbing, and will cause discomfort. It is not, however, to be desisted from on this account, but it is to be continued until all the crusts are removed. If some of the hairs, or all of them, come out, no harm will result, for they will soon be renewed. If they are ulcerated at their roots to such an extent that they are likely to fall off in a short time, the sooner they come away the better for the cure. After the cleansing has been thoroughly accomplished, some substance, such as vaseline, cold cream, simple cerate, or mutton-suet without salt, should be rubbed, in very small quantity, along the roots of the lashes. This is to prevent the sticking together of the lids—a very unpleasant symptom usually observed on awaking from sleep. The water used in cleansing the lids should be tepid. Breast-milk, cow's milk, and other popular washes for inflamed eyelids have no virtues beyond those of simple water. Their use should not be encouraged.

Severe cases, or those of long standing, may require, after the washing, more energetic treatment, that is, more powerful applications, but these should only be made under the advice of a physician. If the case is one that is aggravated, or maintained by the fact that the patient requires glasses and does not wear them, the eyes must be examined by an oculist, and the proper glasses prescribed.

Styes—Hordeola.

These are essentially small boils at the edges of the lids. They begin in the hair-follicles or in the glands of the cartilage. As is well known, they are apt to occur in rapid succession on the same eye.

Causes.—It is probable that all boils are in some way, not as yet explained, connected with or dependent upon an impairment of the general health, so that patients who are affected with styes should consider them as warnings with reference to some general and worse affection than the one of the eyes. It may be a disordered condition of the digestive apparatus, or impoverishment of the blood, and there may be local causes acting with these.

Symptoms.—A stye appears as a red, usually small swelling at the edge of the lid. It sometimes disappears without breaking,

but more often it suppurates and discharges a small amount of pus, when the pain and tension in the eyelid, which have been considerable, are relieved.

Treatment.—The use of small poultices applied to the parts for a few hours, and then the evacuation of the pus by a knife in the hands of a surgeon, are means of treatment that usually shorten the duration, and alleviate the discomfort of styes. In applying the poultice care should be taken that it be applied to the stye only, and not to the eyeball, for poultices are very dangerous applications to the eye itself. Where styes occur in frequent succession, physicians are sometimes able to abate them by suitable advice and applications.

The use of very small poultices in the stage of swelling and pain, followed up by the application of vaseline, cold cream, mutton-suet without salt, or the like, when the stye has broken, is about all the local treatment that is of service in alleviating its pain and discomfort.

An ointment of the red oxide of mercury, one or two grains to the drachm of simple cerate, is said, when rubbed upon the inflamed part, to sometimes prevent its full development. The writer, however, has more faith in careful attention to the state of the general system, which should be carefully looked into if styes continue to recur. If there be any short-sightedness or other condition of the eye requiring spectacles, these should be properly chosen and worn.

Tumors of the Eyelid—Chalazion.

The eyelids are sometimes affected with small growths that are not dangerous. These tumors are usually the result of a closure of the mouth of the little tubes found in the cartilage of the lid, and described on page 232. When the oily matter formed in these tubes or glands cannot find its way out in the natural way, it extends upon each side and forms quite a lump. The process is as purely mechanical as the distention of any flexible tube from overfilling. It is probably an inflammation at the mouth of the tube, which finally closes it.

Treatment.—These growths sometimes disappear of themselves without any treatment. Sometimes they become so distended as to burst, and for some days considerable disfigurement results. More frequently, however, the opening at the end of the canal is restored, and a cure is effected by the evacuation of the collected material. They often, however, do not disappear for a very long time, and they should then be cut out by a surgeon. The operation

is a simple one, but quite painful, and it is usual to cause the patient to inhale ether when it is performed. All the operations upon the outer parts of the eye are usually more painful than those upon the interior, simply because these parts are more abundantly supplied with nerves of sensation than the other.

Displacement of the Lids Inward or Outward—Entropion and Ectropion.

These deformities of the lids are chiefly produced by two causes : inflammations of the lining membrane of the lids (the conjunctiva), or injuries of the lids themselves. The natural curvature of the lids, as will be seen by a glance at a healthy eye, is admirably and exactly adapted for the protection and comfort of the eyeball. Any curving in or out of these parts produces very considerable discomfort and annoyance. If the lids be turned in, the lashes press upon the delicate structure of the ball, and cause serious inflammation. If they turn out, the carrying off of the tears is interfered with, and the eyeball is exposed to the unpleasant and injurious influence of dust, dirt, the wind and the like.

Treatment.—There are surgical operations for the relief of these affections, which are successful in a good proportion of cases ; but it should be remembered that these are consequences of disease and injuries, and not primary affections, and hence we may not expect the results that are to be obtained when the original affections are treated. Besides, injuries of the lids are sometimes of so destructive a character, that their results are irreparable.

Individual eyelashes are sometimes displaced without any particular curvature of the lids. If their repeated removal does not overcome the faulty disposition, their roots may be destroyed by surgical procedures.

Paralysis of the Muscles of the Eyelids.

All the muscles that move the eye may become unable to do their work. As a rule, however, only one, or a group supplied by the same nerve, is paralyzed. The muscle that lifts the lid is quite often thus affected, and causes what is known as *ptosis* (a falling). In this form of paralysis, the nerve, called by anatomists the third cerebral nerve, one that passes from the base of the brain to this muscle, as well as to four other muscles of the outside of the eye, is the seat of disease or injury at its origin, or in some part of its course.

Causes.—These sometimes act in the womb, and children are born with paralysis of the lids, so that they cannot be opened widely. Injuries and diseases of the brain are also causes. The so-called blood-poisons, such as syphilis, may and do very frequently cause paralysis of the muscles of the lids.

Treatment.—The congenital form of paralysis of the upper lid, and that resulting from injury, may sometimes be benefited to some extent, but generally not entirely cured, by a surgical operation, which shortens the lid and thus relieves the paralyzed muscle of a part of its weight. That caused by the poison of syphilis may often be entirely cured by the treatment appropriate for the constitutional disease.

Paralysis of the Muscle that Shuts the Lid.

The seventh cerebral nerve supplies this muscle (*orbicularis*). It is therefore an affection of this nerve that causes an inability to close the eyes. Inasmuch as the muscle with which the cheek and lips are moved, are also supplied by this nerve, such a paralysis is usually accompanied by a falling down of the angle of the mouth, and an inability to pucker the lips, as in the act of whistling, etc. If the portion of the nerve that supplies sensation to the face is also affected, there is also insensibility as well as loss of motion. (See Paralysis of the Face.) For some unexplained cause syphilis is more apt to attack the third than the seventh nerve.

Exposure of the face to a draught of air, the breaking of a blood-vessel at the origin or in the course of a nerve, inflammations of the neck and face, the excessive use of tobacco, are also well-defined causes of paralysis of this nerve.

Sometimes the disease or injury of the nerve causing the paralysis affects it before it passes out of the skull. Sometimes it is affected in its passage through the drum of the ear, or just after it has come out at the angle of the jaw, or even not until it passes over the face itself.

Treatment.—The treatment is, of course, to be directed toward the cause, and will vary according to this. Paralysis of the nerve from exposure to draughts of air is usually recovered from spontaneously. Electricity and mechanical support are very useful in the care of these affections.

Twitching of the Eyelids.

Involuntary movement of the muscles of the lids is a symptom usually seen in connection with general disease of the nervous system, such as chorea, the so-called St. Vitus's dance. Indeed, it is often a kind of chorea, and the reader is referred to the section upon that subject for fuller information.

Spasmodic Closure of the Lids.

The eyelids are sometimes firmly and spasmodically closed in the course of different affections of the eye. The reason for this closure is either an abnormal sensitiveness to light or great swelling of the lids. This condition is simply a consequence of the affection that causes the dread of light and the swelling. It will be again alluded to in the description of those diseases.

Bruises of the Eyelids.

The eyelids are sometimes injured by blows from the fist, or from some missile which ruptures the blood-vessels, and permits the escape of blood into the loose connective tissue of the lids. The condition is popularly known as a black-and-blue eye. If no parts deeper than the lid be involved, time will soon effect a cure. Cold applications are usually grateful to the eye. It is believed by some that the application of ice-water, evaporating lotions, extract of witch-hazel, or arnica, hasten the absorption of the blood, but this belief is not shared by the writer of this chapter. Iced cloths, applied often enough to always have the eye kept cool, and never warm, are to be urgently recommended, however, in the hours immediately after the injury, since they lessen the heat and swelling. Tradition, among the laity, speaks well of a poultice of raw beef, an oyster, or the like, and they undoubtedly are grateful to the eye ; but such applications are dangerous, especially if kept on for many hours in succession, and ought never to be made, except under close medical observation. They are agreeable to a bruised eyelid, hence their traditional popularity. The disfigurement is so great from a black and blue eye, that in large towns there are artists who remove it by a skilful painting of the discolored parts.*

[* A solution of nitrate of potash in water, applied with muslin cloths, will often change the color from dark to a brighter red.—ED.]

Wounds of the Lids.

These should be treated at once by a surgeon, so that deformity may be avoided by a skilful bringing together of the divided parts by stitches.

Affections of the Tear Apparatus—Lachrymal Diseases.*

The diseases of the tear-apparatus are quite common in all countries where the climate is variable. In general terms they may be said to be most commonly produced by the same influences as those which cause a cold in the head. The lachrymal gland (see figure on page 233), however, is rarely the seat of disease. The chief troubles of the so-called lachrymal or tear-apparatus are in the conduction or carrying off of the tears. A "weeping eye" is the result of some obstruction in the conducting apparatus. By this term, as is perhaps well known, is meant an eye that is constantly moistened with tears which are not carried off into the nostril, but which run over the cheek. Since these passages are narrow, a slight swelling of their lining membrane is sufficient to impede the passage of the tears. This swelling is generally the result of a cold in the head, or rather of the swelling of the lining membrane of the nostrils and pharynx, which is continuous with that of the tear-passages. This swelling is one of the symptoms of a cold in the head. Another prominent symptom is an increase of the natural secretion of the membrane covering the eye, lining the eyelids and the lachrymal and nasal passages—the conjunctiva. This condition increases the work of the apparatus for carrying off the tears, while the former diminishes the size of the parts through which the tears have to pass. Under the usual treatment for a cold in the head, or, perhaps, with no especial treatment, these symptoms pass away, but it sometimes happens that the cure is not complete, and the passage into the nose from the sac (see figure) is left smaller than is natural, and perhaps, also, the little canal leading into the sac. We then have a narrowing or stricture of the tear-passages. If, added to this, there is an increase in the secretion from the mucous membrane lining the parts, we have catarrh of the tear-passages.

These two conditions are usually united in the same case. The collection of tears in the corner of the eye, and their escape over the cheek are the chief symptoms of a "weeping eye," when the

* Before studying this section, it will be well for the reader to refer to the anatomy of the parts involved, on a preceding page.

disease is of a mild character. There is, however, a form of this trouble in which the mucus collects in such quantities in the sac as to enlarge it and form a tumor or swelling at that point. This may often be emptied by pressing upon the enlarged sac. Many people live for years with such a deformity and inconvenience, with no attempt at relief.

There is danger, when the disease reaches such a point as this, that pus or matter may collect in the sac. We then have to deal with a very painful and serious affection. The formation of pus in the human body is generally ushered in by a chill or, at least, chilly and uncomfortable sensations, and when it occurs in the eyelids or appendages of the eye there is no exception to the rule. The eyelids swell very much at this time, so that it seems as if all the tissues of the parts were involved. A mistake is sometimes made in supposing that a disease of this kind is an attack of erysipelas. A little attention to the history of the previous condition of the tear-passages, and a close examination of the corner of the eye over the sac, will show the real nature of the trouble. This formation of pus is preceded by the ordinary symptoms of what is termed inflammation. These symptoms are heat, redness, swelling, and pain. If the disease be not recognized at an early date and appropriately treated, after some days of intense suffering the pus will make an opening in the skin of the sac and force its way out. Although the patient will get relief from his sufferings, there will be apt to remain a permanent opening in the skin. This opening is called a *fistula*. This condition is worse than the originally existing "weeping eye."

Causes.—The causes of these affections of the tear-passages have, perhaps, been plainly enough indicated in the statement that they are chiefly the result of an inflammation of the mucous membrane lining them, or of a continuation of such an inflammation from the nose and throat to the eye. The causes of catarrh are discussed in another part of this volume.

It is sufficient to say here that all improper habits of life, all diseases which lessen the power of resistance to changes of temperature, may be causes of catarrh. Syphilis is also not infrequently a cause of catarrh of the tear-passages, as well as of catarrh of other mucous membranes.

Treatment.—Probably every observant reader of these pages is able to recall examples in his own acquaintance of the "weeping eye," and he will remember that some of these cases have seemed to go on for years without causing anything more than considerable inconvenience. Inquiry, however, will often elicit the fact that there have been, in most cases, occasional attacks of inflam-

mation that have been very painful and severe enough to keep the patient from ordinary employments for several days.

It is true, however, that some few cases do go through life without such acute inflammatory attacks. These cases, which may be properly called exceptional, furnish no good ground for the neglect of a "weeping eye." A simple surgical operation and a few weeks of treatment will often cure the disease, and when they do not, will very much lessen the chances of the formation of an abscess. The treatment, in most cases, is chiefly local and surgical.

The little aqueduct leading along the edge of the lid to the tear-sac is slit up, and made an open canal (see adjoining figure). The passage going into the nose is dilated by means of probes. At the same time astringent washes are sometimes used upon the parts by means of a syringe, or by dropping into the eye. If there are any constitutional causes for the catarrh, these should be removed by appropriate treatment, or all local means will be of no avail.

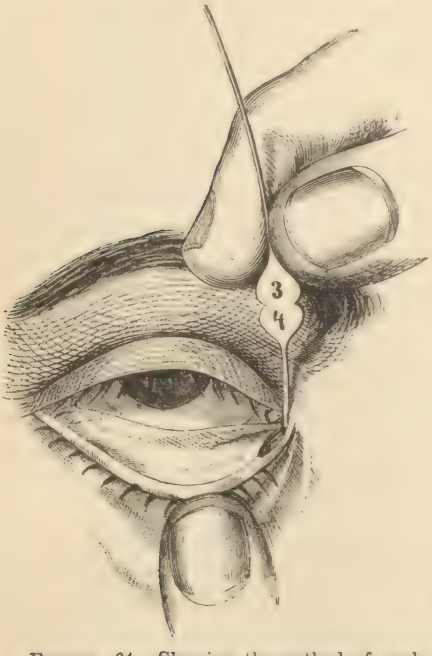

FIGURE 64.—Showing the method of probing the tear-passages. The little canal in the edge of the lid has been slit before the probing is done.

This is especially true of cases caused by syphilis. In very bad, usually neglected cases, when the bone forming a part of the walls of the canal has become diseased, it is sometimes necessary to destroy the tear-sac by caustic, or the surgeon's knife. Some cases are never thoroughly cured by any treatment in the hands of the most skilful men, but much more is done for them than was accomplished by the mode of treatment of years ago, when the disfiguring tubes were worn in the eye.

The local treatment now usually adopted, and which has been described, is that suggested by Mr. Bowman, of London. The probes used for dilating the parts are gradually increased in size until a sufficient enlargement of the narrowed canal has been attained. Nothing is left in the eye, and after the probing the patient is not required to observe any particular precautions, but goes about his ordinary employment.

If an abscess has actually formed, an incision to empty out the pus must also be made externally. The scar from such an opening is very soon obliterated. Even if an abscess has formed, besides opening this it will be necessary to open the canal into the sac, and probe the passage into the nose just as if the case were seen before the abscess had formed. The treatment is often very tedious, but, on the whole, patients seem to be well satisfied with the results obtained.

Inflammation of the Conjunctiva—Conjunctivitis.

What is popularly known as a "cold in the eye" is an affection of the mucous membrane which lines the lids and covers the front of the eye, which is called by anatomists the conjunctiva (*con* and *jungo*, to join together). This membrane is subject to various forms or degrees of inflammation, but they are all modifications of the original variety. We may classify them as: I. *Catarrhal;* II. *Purulent;* and III. *Pustular.*

There are many chronic consequences of these forms of diseases. Some of them have already been discussed in the section on the Diseases of the Lids, but they will be included in the classification for the sake of clearness:

1. Turning in of the lids (*Entropion*). 2. Turning out of the lids (*Ectropion*). 3. Thickening of the lining of the lids, granular lids (*Trachoma*). 4. Blear eyes (*Xerosis*).

Cold in the Eye—Catarrhal Conjunctivitis.

An eye that is affected with catarrh presents the following appearance: The white of the eye has a generally red color. A person who has been trained to observe, will see that all the blood-vessels are full of blood, and that there is not a ring around the cornea or window of the eye (see Fig. 65) that is redder than any other portion. There will also usually be some swelling of the lids, and the mucus and tears will flow in such quantities as to keep the eyes suffused. The patient will complain that his eyes feel as if there were sand in them, and that they became glued together at night so that they can be opened in the morning only after they are carefully washed. If the lid be turned over—rather a difficult operation for a person untrained to it—the lining membrane will be found no longer of a salmon color, with individual vessels to be seen, but it will be of a generally red, perhaps velvety appearance.

There are, however, various degrees of severity of catarrh of the membrane lining the lids and covering the front of the eye. Thus

we may have merely the sticking together of the lids with a little mucus gathered in the corner of the eye, and so little redness that only the practised observer will be able to say that there is any inflammation.

The diseases which may be mistaken for conjunctivitis are inflammations of the cornea and of the iris. Besides, we often meet with a catarrh of the conjunctiva that is merely a symptom of an overworked eye, or one that is working under improper conditions, as, for example, without glasses, when glasses should be worn. It will be seen then that it is not safe to conclude that because a patient has catarrh of the conjunctiva, he has no other or more serious trouble in addition to this.

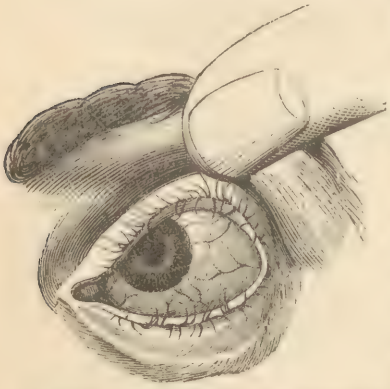

FIGURE 65.—Showing the appearance of the blood-vessels in conjunctivitis or a cold in the eye.

Causes.—It is hard to say just how a person gets a cold in the eyes. We do know, however, that exposure to a strong wind, to dust, to acrid vapors, or bright light, will sometimes be followed by a catarrh of the mucous membrane of the eyes. A severe chilling of the surface of the body may have the same effect, or excessive use of the eyes with bad or feeble light. During the course of measles and scarlet fever, especially the former, there is apt to be catarrhal inflammation of the mucous membrane of the eyes.

Treatment.—A mild case of catarrh of the eyes requires very little medical treatment, while a serious case will demand a very prompt and energetic course. The intelligent person will hardly need to be reminded that there is a tendency to self-limitation in certain diseases of the eye, as well as in those of other parts of the body.

Rest of the eyes, the avoidance of exposure to dust or bright light, perfect cleanliness of the membrane, exercise in the open air under favorable conditions, with lubrications of the edges of the lids with simple cerate or vaseline, or the like, will often be sufficient for a really mild case that is not dependent upon any faulty structure of the eyes requiring the use of glasses. The mild cases will, under this regimen, run their course, and leave the eyes as well as ever. [There is said to be a form of conjunctivitis occurring in malarious subjects, which is cured at once by the use of quinia.] After such an attack, it is well, however, to secure,

by a careful examination, an assurance that the lids have not been left at all thickened.

A severe case is one in which the lids are swelled, the eyes red and suffused with discharge, the edges of the lids very sticky, while the eyes are hot and very uncomfortable, with a sensation as if sand were in them. In such cases the eyelids should be frequently douched with cold water, or cold cloths of one thickness should be laid upon the eyes, and changed so often that they may never be hot, or even warm. When ice is convenient, the cloths, which should be of delicate muslin, or the like, may be laid upon a block of ice, and then upon the eyes. The danger in the use of poultices in such cases is very great. If advice cannot be obtained, a solution of sulphate of zinc or of powdered alum, in the strength of two grains of either to the ounce of pure water, may be dropped into the eye two or three times a day. A few drops is sufficient for this purpose. At night, vaseline, sweet oil, cold cream, or the like, should be smeared between the edges of the lids along the eyelashes. The patient should not be kept in bed, and in fine weather may walk about as usual, protecting his eyes from bright light by blue or London-smoke spectacles. Goggles should not be worn, for they keep the eye too warm.

The patient with catarrh of the conjunctiva should avoid all places badly ventilated or crowded, or those where there is smoke or dust, or a bright light or a strong wind.

As has been said, the disease is self-limited, and all the treatment is intended to guide its course rather than to cut it off.

Patent eye-washes, some of which contain substances that may be permanently injurious to the eye, such as lead, should not be used. Blisters are of no use, and simply annoy the patient. Poultices of all kinds, whether of tea-leaves, alum-curd, oysters, or bread and milk, are very dangerous to the eyes, and should never be used for any affection of any part of the eyeball. It is necessary not to do too much for a disease of the eye. When there is doubt as to what the trouble is, do nothing but keep the eyes clean, and get competent advice as soon as possible.

Purulent Conjunctivitis.

This is one of the most dangerous of the affections of the eyes. Its symptoms are, fortunately, unmistakable. The affection occurs suddenly, beginning as a catarrh. The eyelids become red and greatly swollen, so that they can scarcely be opened. Pus streams out of the eyes when the lids are pulled apart, and the pa-

tient complains of a great deal of heat and tenderness in the lids and eyes.

On separating the lids, the front of the eye is red, and sometimes it is so swollen as to be lifted up and form a ring around the cornea, or window of the eye. This inflammation may occur in the newly-born infant as well as at any time of life.

The Causes are a direct contact of the eye with pus from another part of the body of the same or another patient—for example, a careless patient suffering from gonorrhœa or leucorrhœa may bring some of the poisonous pus between his or her eyelids and thus set up an attack. Of course, matter from another eye affected with the disease will produce the disease. A surgeon may be unfortunate enough to allow some of the matter from an eye affected with purulent conjunctivitis to enter his own eye. A careless nurse may allow some of the discharges from the parts of the mother, after childbirth, to dry upon a napkin or upon her hand, and then bring it into contact with the conjunctiva of the babe, where it will dissolve and cause an outbreak of purulent conjunctivitis. It is a highly contagious disease. It should also be remembered that even a chronic catarrhal conjunctivitis may advance to be a purulent one without the direct contact of any poison from another part of the body, or from another eye. Hence we may not say that every case of purulent conjunctivitis is caused by contagion. This is rather an important point. The writer was once a witness in a case of alleged malpractice, which involved this question. It is very important to isolate the patient suffering from purulent inflammation of the eye from all persons except the attendants, until the discharge has ceased.

The utmost care should be taken that none of the implements used in cleansing the eyes of the patient should ever be used by any one else, without a thorough washing and disinfection. If one eye alone be affected, it is better to close the other with sticking-plaster and a bandage, that no pus can be carried into it.

Treatment.—If possible, a surgeon should be called in to treat so formidable a case as that now described, but if the reader of these pages is unfortunate enough to be obliged to advise in such a case, in the absence of medical aid, or be himself the victim of it, he should carry out the rules just stated about contagion, and then proceed to apply ice-water or very cold water, night and day, and to cleanse the eyes with tepid water at least once an hour. At the same time the eyes should be washed with a solution of alum, in the proportion of a teaspoonful to a pint of water, six or seven times a day. This treatment is applicable to the child just born as well as to the adult. In the former case a little more care is to be

taken in regard to the use of ice, lest the tender lids become excoriated. In case the very cold water causes great discomfort it should not be used.

Cleanliness of the eyes is the most important part of the treatment. Small bits of old linen, very soft and very fine, of a single thickness, dipped in tepid water, are the best means of cleansing the eye. The use of a syringe in unpractised hands is somewhat dangerous both to the patient and to the attendant. The surgeon may use, in addition, leeches and nitrate of silver, if his judgment dictates, but the non-professional attendant should not venture on any more positive treatment than that which has been delineated.

Opening the lids in order to clean the eyes will require some tact and patience. The attendant, however, should not be satisfied unless he does actually open them by gently pulling them apart, after soaking the edges so that the matter may be wiped out, or a stream of water be allowed to pass between them. The same rule as to poultices, or any kind of continued warm applications to the eyes, is to be observed here as in the treatment of catarrh.

Poultices break down the delicate tissue of the front of the eye, and if applied even for a few hours, may ruin the sight. The most deplorable consequences of this kind of treatment are constantly to be seen in dispensaries and infirmaries, and sometimes in private practice. But these remarks are not to be construed as an objection to using warm water for a few moments at a time.

Consequences of Acute Conjunctivitis.

Both catarrhal and purulent conjunctivitis, even if they are subdued without damage to the front of the eyes, sometimes leave behind consequences that are dangerous to the integrity of the organ, such as chronic inflammations and distortions of the lids. Chronic conjunctivitis should be treated by mild astringents, such as alum, two grains to the ounce, and by lubrication of the edges of the lids with vaseline, cold cream, mutton tallow, etc. Great care should be taken to avoid exposure of the eyes to improper influences. But the advice of a medical man can usually be had in chronic cases of this kind. This is the more necessary, because a case of supposed chronic inflammation of the mucous membrane of the eye sometimes turns out to be an inflammation of the deeper parts, which is a more serious matter, and requires very different treatment.

The patient who believes that his affection is one of the conjunctiva merely, should make himself sure of that fact when the opportunity offers. Besides, a chronic affection of the mucous

membrane may, by direct extension, become one of the deeper parts. The boundary lines of disease are not always distinctly marked.

Thickening of the Lining of the Lids—Granular Lids—Trachoma.

The so-called granular lids are by far the most frequent consequences of neglected inflammation of the mucous membrane (conjunctiva) of the eye. Lids are, however, often supposed by non-medical persons to be granular, when they are not at all so. The red line along the edge of the lid, which shows that there is disease of the roots of the lashes, or of the glands, is sometimes supposed to be one of the symptoms of a granular eyelid. Unless the lids are turned over so as to expose the membrane lining them (see anatomy of eyelids), it is impossible to say, whether or not, they are granular. It requires some little knack and experience to turn over the upper eyelid, hence the changes there, or the presence of foreign bodies upon it may escape notice. The little operation of turning over the upper lid is performed in the following manner: The patient should sit down with his head supported by another person, or leaning against some good support, while the operator stands in front. The person whose lid is to be turned over, should then look down. This is not always an easy thing to do, for the natural inclination when told to look down, is to turn the whole head downward, and not the eyes. It is the latter that is wanted, for when this is done, for evident reasons, it will be much easier to turn over the lid. After the patient has turned the eye well downward—and this action may be facilitated by telling him or her to look at his hand, or the like—the operator seizes hold of the very edge of the lid by the fingers of the right hand, and stretches it downward, and at the same time presses the skin of the eyebrow with some firmness upon the bone. The second stage of the procedure consists in turning the lid over the thumb. No pencil, penhandle, nor instruments but the two hands are needed for this little operation. The person who learns to perform it will sometimes be the means of relieving from much suffering, perhaps, a fellow-passenger in a railway carriage, who has got a cinder under the eyelid. As has been said, it is only when the lids are well turned over, that we can say that there are granulations, or, to speak more correctly, thickening of the lining membrane of the lid.

When once the lids are turned over, if there are granulations, instead of seeing the salmon color of the membrane, we find it of a

deep red hue; instead of perceiving the individual blood-vessels like little threads, we find a general velvety appearance, and perhaps we see very minute bodies, looking like the spawn of fish or frogs.

As has been said, granular eyelids are the result of an inflammation of the lining membrane. This being unchecked causes the tissue to grow, that is, its natural structures become enlarged. The disease is very apt to be associated with a low state of the general health and bad habits of life, although a patient may be in full health and yet suffer from the disease. If unchecked, thickening of the conjunctiva causes deplorable consequences. The cornea or window of the eye is finally covered over with blood-vessels, or ulcerated, or becomes opaque, and thus the sight is very much impaired, and sometimes nearly destroyed. When things have gone on to this state, a cure is often impossible.

Treatment.—While all attention should be paid to any defect in the mode of life, or food, or habits of the patient, the treatment is pre-eminently local. What are known as astringents, and astringent caustics—such as alum, sulphate of copper, tannic acid—are applied to the eye by a surgeon, while the patient protects his eyes from bright light, keeps them very clean by frequent bathing in tepid water, and uses a mild wash of alum, or sulphate of zinc (two grains to the ounce) or the like, and anoints the edges of the lids with ointments such as have already been mentioned. Patients with thickening of the lining of the lids should remember that this is a chronic disease, and not self-limited, like many an acute one. The golden plan for treating granular lids is that of prevention. A cure must often be, at the best, only partial; besides, in many cases, the treatment will require months and even years.

Growths upon the Mucous Membrane of the Eye—Pterygium.

This is an affection which may, perhaps, arise independently of any general inflammation of the conjunctiva, or which may be a consequence of it. It is a triangular-shaped thickening of the membrane and enlargement of the blood-vessels situated in one or both corners of the eye. The apex of this triangle is toward the cornea. From its fancied resemblance to the wing of a bat, it has the name, in surgical science, of *pterygium* (little wing). It is probably caused by inflammation, and occurs chiefly in those whose eyes are constantly exposed to a long sweep of winds on prairies, on the seas, etc. It is not necessary to interfere with pterygium

unless it grows upon the cornea, when it may be removed by a surgical operation. The scar from the removal of a pterygium

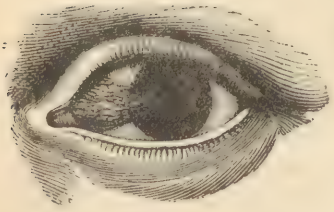

FIG. 66.—Pterygium.

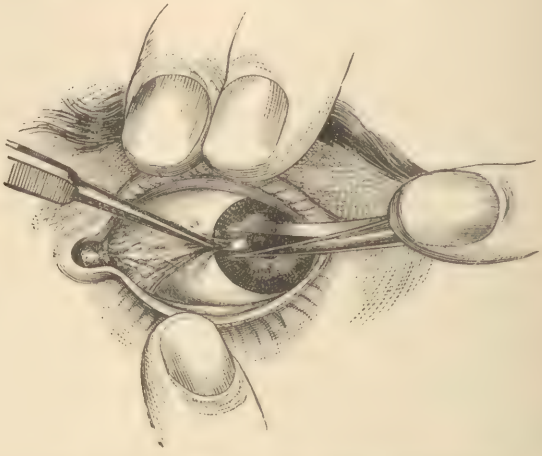

FIG. 67.—The operation for removal of pterygium.

disfigures as much as the disease itself. Astringents and the like are of no service in cases of this kind.

There are other very small, almost infinitesimal tumors sometimes found upon the conjunctiva, not usually large enough to constitute a blemish. They may be cut off if they cause deformity.

Adhesion of Lids to the Ball—Symblepharon.

The eyelids sometimes grow to the ball of the eye, in consequence of burns which have destroyed the mucous membrane. It is extremely difficult to break up these adhesions permanently, and the most skilful operations do not always succeed. (See Burns of the Eye.)

Foreign Bodies on the Outside of the Eye.

Any substance which has no proper place in or upon any part of the body is called, in technical language, a "foreign body." The lodgment of foreign bodies upon the outside of the eye is of very frequent occurrence. Railway and steamboat travel are fertile sources of such intruders as cinders, while those who work in machine shops are in constant danger from sparks and bits of metal entering the eye. In the firing or accidental explosion of firearms there is another source of danger from percussion caps or grains

of powder. Children climbing up and down trees have been known to get buds and bits of leaves on the outside of the eye.

It is a cardinal principle in examining an eye to first look for a foreign body, especially when symptoms of inflammation are present. This can only be done thoroughly when the lids are turned over by the method already described on page 268. Any small blunt instrument, or even a handkerchief, is sufficient to remove an offender from the lid, but to remove one from the cornea, or transparent front of the eye, sometimes requires very delicate instruments and much skill. Workmen in machine shops often acquire much of this dexterity. The danger in working at foreign bodies on the transparent part of the eye, is, that they may pass through this thin and delicate membrane, or that rude attempts to remove them may push them further in. A foreign body *on* the eye is a very painful and troublesome affair, and may be serious ; but a foreign body *in* the eye is *always* extremely dangerous, not only to the eye in which it is, but also to the fellow eye, so that the utmost care should be taken by the inexperienced person when called upon, as he may sometimes be, to remove a foreign body from the front of the eye. If necessity compels the interference of a non-medical person, he should first place his patient in a position where the eye is in a very good light, and where the sufferer can lean his head firmly against some support. Then, having the assistance of one other person, if possible, he should endeavor to tilt, with a delicate bit of wood or the like, the substance from off the front of the eye, while he holds the lids firmly but gently apart. Only a blunt instrument should be used on the eye by any but a surgeon.

There is a popular notion that "eye-stones" * [or flax-seeds] are valuable means of removing foreign bodies from the eye. The writer knows travellers who carry them constantly, and who not only use them on their own eyes, but confidently advise them to others. They often accomplish the removal of the foreign body, but sometimes they do not ; then they cause serious inflammation. They act by producing an irritation of the lids, which causes a great flow of tears that may wash out the offending body. Besides, they hold the lid a little off from the ball, and thus give more room for the escape of the foreign substance. If there is no person near the suffering one who is able to turn over the lid, eye-stones should not be used, but the following plan may be tried, which will usually be successful, unless the foreign body is upon the cornea : The lid should be put on the stretch and held away

* An eye-stone is a hard and smooth substance found in certain shell-fish.

from the ball, and at the same time should be stroked directly downward. Rubbing in various directions is to be avoided, for thus the foreign body may be rubbed deeper into the tissue. An eye-stone has no mysterious virtue, and is simply another foreign body introduced into the eye.

Inflammation of the Cornea—Keratitis.

About one-half of the whole number of cases of disease of the eye involve the cornea. They are very important cases, because impairment of the transparency of this beautiful and essential membrane, or even a change in its curvature, renders distinct vision an impossibility.

"Those that look out of the windows are darkened," for the cornea is the medium through which the light enters to undergo the changes that transform it into vision. Diseases of the cornea are of two general kinds : *primary* and *secondary*.

The primary are perhaps more dangerous. The secondary form, consequent upon neglected granular lids, have been already alluded to. I shall attempt to describe but a few of the forms in which inflammation of the cornea may occur. The general divisions, however, of these dangerous diseases may be thus given : I. Ulcers and abscesses of the cornea. II. General opacities. III. Blood-vessels upon the cornea.

Ulcers of the Cornea.

Ulcers and abscesses of the cornea usually occur in persons who are not strong and well, so that a recent white spot, which is not a foreign body, is an evidence of some failure in the general health. These spots, which the experienced eye may recognize as actual losses of substance or little pits in this membrane, are usually caused by the change of the proper elements into pus.

Inasmuch as this tissue is not supplied with blood-vessels, it is peculiarly liable to disease, but on the other hand this want is somewhat made up by the abundance of nerves, which often give timely warning of danger.

Treatment.—All diseases of the cornea that are not caused by foreign bodies, or that are not dependent upon granular lids, or other mechanical causes, demand, first of all, attention to the general health of the person affected, which usually has been impaired by improper habits of life, constitutional disease, or the like. Besides this, the eye should be protected from a strong or dazzling light, from dust, wind, tobacco smoke, etc. Protective

spectacles of a blue or London-smoke tint, and shades are generally necessary.

Eyes affected with inflammation of the cornea should not be used for reading, writing, sewing, nor indeed in any employment on objects near at hand.

Confinement of the patient for any great length of time to a dark room is not usually proper in any kind of disease of the eye. The most exaggerated notions as to the necessity for the exclusion of light in such affections are very commonly held. In the case of disease of the cornea, the irksomeness of life in a dark room, and the absence of fresh air will have an injurious effect upon the general health of the patient. Bandages, spectacles, and shades, furnish sufficient protection in nearly all cases. These allow the patient to go about in the open air and sunlight. Eyes that have been operated upon, and in which it is necessary to secure union of the cut surfaces by perfect rest, with a few others, are the only cases that demand confinement to one room for considerable time.

Oculists use various drugs in the treatment of ulcers of the cornea, and they sometimes resort to surgical operations. Sulphate of atropia, a preparation of the plant known as *Atropa Belladonna*, is the one most frequently used. The effect of belladonna upon the eye is to enlarge the pupil, and it is thought that it contracts the blood-vessels, and relaxes the muscles of the eye.

Nitrate of silver, leeching, and blisters, are not applicable to ulcers of the cornea. Atropia often quiets a very painful eye in a short time, but it should not be used, except under medical advice, unless absolutely necessary. The strength of the solution ordinarily used, is two grains to the ounce of distilled water, and one drop is sufficient at each application.

Spots upon the Cornea.

Diseases of a milder type than ulcers, and ulcers that have run their course, often leave spots upon the cornea. They are usually permanent, although, in the case of young persons, they may sometimes be obliterated in the course of time. In recent cases surgeons sprinkle irritating powders and place ointments upon the eye, which sometimes assist in the absorption of the opacities. These dense white spots on the cornea are sometimes improperly called cataract by non-medical persons. It is often supposed that they may be removed by an operation, but this is incorrect. They should not be interfered with in such a way.

Inflammations of the Cornea.

There are several distinct forms of inflammation of the cornea which it is impracticable to describe minutely, as would be done in a treatise for students of medicine, but there is one form that is so common and so dangerous that an attempt will be made to give a sketch of its symptoms.

Pustular Inflammation of the Cornea—Phlyctenular Keratitis—Scrofulous Keratitis.

Physicians often find very minute bladders upon the cornea in young children who are improperly or insufficiently fed. These little bladders (vesicles) are usually soon covered by blood-vessels, or become ulcers by breaking down and extension, and they are generally accompanied by swelling of the lids and great fear of the light, so that the eyes are kept tightly closed, and when they are forcibly opened hot tears run out. The face is very often disfigured by fissures and ulcers upon it, the lymphatic glands of the neck swell, the tongue is at the same time furred, and the patient, who is usually a child or young person, has a very sorry and distressed appearance. To the inexperienced person this disease resembles purulent inflammation of the mucous membrane of the eye, but careful observation will show that it is not *matter* or pus, but *water*—tears, that flow out from between the lids when they are forcibly opened. This is the great distinction between the purulent inflammation of the mucous membrane of the eye, and a severe case of inflammation of the cornea, of the kind just described. Mild cases, when there is very little swelling of the lids, will, of course, not cause any such mistake to be made.

This form of inflammation very often *begins* in the conjunctiva. A long-continued inflammation of this kind upon the conjunctiva will invade the cornea also.

Treatment.—That which has been said upon page 272, sufficiently covers the ground as to corneal affections in general. It is only necessary to add that no applications that cause pain or even severe smarting, should be made to an eye suffering from disease of the cornea, unless under the advice of medical authority.

Inflammation of the Cornea from Inherited Syphilis.

There is an inflammation of the cornea occurring in young persons and in children, which is the result of an inherited constitu-

tional disease—syphilis. In other words, when one or both parents are syphilitic, their children may be born with, or soon exhibit, disease of the cornea. The cloudiness of the cornea, is, in these cases, usually accompanied by catarrh of the nostrils and throat, impairment of hearing, and a peculiar want of development of the central upper teeth which causes notches to form in them. Local treatment is of very little service in these cases, but the appropriate constitutional and hygienic treatment will often entirely cure the affection.

Results of Inflammation of the Cornea.

One of the results of a severe inflammation of the cornea, so severe that it bursts and allows the pupil to fall forward upon it, is a change in its shape, so that the whole globe is deformed. There is a great variety of these disfigurements. The globe is sometimes so much enlarged that it cannot be covered by the lids. Again, some portions of it protrude, while the other parts of the ball retain their proper shape. When the iris or the choroid coat of the eye falls forward in this manner, their black or dark color,

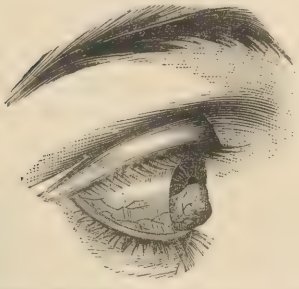

FIGURE 68.—Partial staphyloma of the cornea.

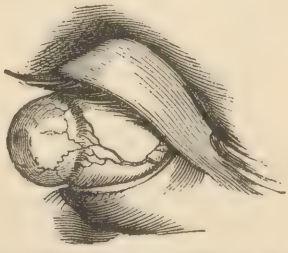

FIGURE 69.—Total staphyloma of cornea. Such an eye may readily become an irritant to its fellow.

through the thinned white of the eye, cause an appearance not unlike that of a brown grape ; hence the medical name for these protrusions of the eyeball is a "grape-like tumor"—*staphyloma*. They greatly disfigure the patient, and when the eye is sightless, as many of such eyes become, it may be removed by a surgical operation, after the individual has attained full growth, and an artificial eye may be worn. Sometimes a deformed and protruding eye causes a sympathetic affection of the other eye. In such a case its removal is imperatively required, and no delay should be allowed. The subject of *sympathetic inflammation* of the eye is fully discussed on another page.

Conical Cornea.

This is quite a rare affection of the cornea that impairs the sight very much, but which easily escapes the attention of the unpractised observer. In this disease the cornea remains transparent, but its curvature is altered, so that instead of being a certain part of a sphere, it assumes the shape of a cone. The affection generally occurs in weakly persons, although those who are apparently healthy and strong may suffer from it.

Conical cornea causes very great impairment of vision if it exists to any extent. The eye is short-sighted from being lengthened from before backward, and from its irregular curvature there is great distortion of the images formed on the retina.

The Treatment of this affection is not, on the whole, satisfactory, although, at times, something may be done by a surgical operation which aims to flatten the cone. Spectacles containing only a transparent slit are sometimes of service.

Diseases of the Sclerotica, or White of the Eye.

The diseases of the white of the eye, or of the sclerotica (*hard* tunic) are not of sufficient importance to lead the writer to do more than name them in an article of this kind. This part of the eyeball participates in the inflammations of the cornea, and of the lids and iris, as well as the interior parts of the eye, and shows this by an undue redness, which the careful observer may distinguish from that of the mucous membrane covering it. It may also become so thin in the course of disease as to allow the brown coloring matter of the choroid coat to show through. There are persons, however, who are born with a thin sclerotica or white of the eye, so that the reader may not be alarmed if he detect a faint tinge of brown glimmering through the white of the eye.

The sclerotica may also protrude in various parts and deform the eyeball. A *wound* of the sclerotica is dangerous to the eye.

Inflammation of the Iris—Iritis.

This is a dangerous disease, and is sometimes mistaken for one that is not so important—that is, catarrhal inflammation of the outer membrane of the eye, or, as it is popularly called, *a cold in the eye*, described on page 263. Probably no pictures or descriptions will give a clear idea of this affection, but I will attempt to state some of its prominent symptoms, so that those upon the sea

or in remote places who read this section, may be somewhat on their guard if called upon to advise in regard to, or if they suffer from, an inflammation of the eye.

1. The first prominent symptom is *severe pain in the eyeball* and about it. This is a symptom found also in some inflammations of the cornea, in inflammations of the back part of the eye, so that it is not a distinguishing sign of this disease. An inflammation or disease of the cornea will soon be detected by any intelligent person who studies the symptoms on page 272 to 274.

A cold in the eye does not, as a rule, cause pain severe enough to keep a person awake at night. The sensations from a catarrh in the eye are rather those of discomfort. With any considerable catarrh there is some gluing of the edges of the lids on awakening from sleep. This does not usually occur in iritis. The pain from iritis is severe, and it is apt to extend in the course of the nerves to the forehead, the side of the head, the cheeks, and even to the teeth, so that it may be mistaken for neuralgia of the face. Neuralgia affecting the eyeball is always a serious symptom. It may mean an inflammation of the iris, or that other still more dangerous affection, hardening of the globe of the eye—glaucoma.

2. *Dread of light* and involuntary closure of the eyelids. This symptom, as has been shown, is also seen in keratitis, especially in that of young children.

3. *Contraction of the pupil.* Wherever an eye is very much reddened, and medical advice cannot be obtained, the pupil of the eye should be carefully examined under a good light. The natural or healthy pupil will open and shut, so to speak; at least it will contract and dilate under strong light. This test may be made by alternately opening and closing the lids in strong light. The lids should be closed and then opened very rapidly, and the pupil carefully watched the instant the eye is opened. If the pupil does not move, and if there be pain and fear of light, we may strongly suspect the existence of an inflammation of the iris.

4. The *character of the redness* of the eye is also of great importance. Only a close observer will get much from this symptom, however. Such an one will find that the redness in iritis is confined chiefly to the ring made by the cornea, as it fits like a watch-glass into its case, and that it radiates from this surface—that it is not a net-work-like redness such as we see in a cold in the eyes.

If one is obliged to form an opinion in a given case as to whether it be an affection of the iris or not, a drop of a solution of the sulphate of atropia, of the strength of two grains to the ounce, or even much weaker, will soon settle the question. If

the pupil dilates freely and promptly, and becomes large and circular in a few minutes, our fear of iritis may be gone. As has been indicated, the determination that a case of inflammation of the eye is not one of the iris, is a very important matter, for if an iritis be not properly treated, the eye will very soon be lost. For this reason, if the reader is obliged to make a decision as to whether or not a case is one attacking only the outer membrane of the eye, he should proceed with great care, and if, finally, he is not able to decide positively, he should adopt the treatment for iritis.

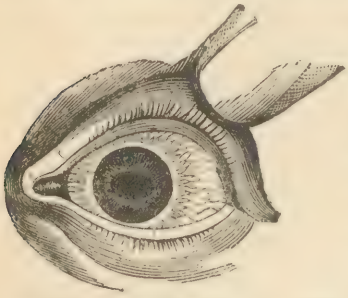

FIGURE 70.—Showing the radiate character of the overloaded blood-vessels in iritis, and also the irregular pupil.

Causes.—The causes of iritis are quite numerous, but one of two constitutional diseases are very apt to be at the basis of an inflammation of this kind. These are syphilis and rheumatism. Extensive use of the eyes may perhaps produce the disease without the existence of any rheumatism or syphilis, but by far the larger proportion of cases occur in connection with these diseases. In the inflammations of the eye occurring after accidental injuries and surgical operations, the iris is generally involved. The so-called sympathetic inflammation is largely one of the iris.

Treatment.—From what has just been said, the treatment for iritis will naturally be both *constitutional* and *local*. Here, however, the local treatment is pre-eminently important, for if neglected, serious mechanical impediments to perfect vision may occur. The most important local application in a case of iritis is some one of the preparations of belladonna. The best of these is the sulphate of atropia. It should be used of the strength of two grains to the ounce of water, a drop being placed in each eye from three to six or more times a day, according to the severity of the symptoms. A camel's-hair brush, a bit of cotton-wool twisted on a match or wire, or a dropper, such as is readily obtained in the shops, are some of the convenient means of getting the solution in the eye. The fluid extract of belladonna, using a solution of from one to six drachms to the ounce, or the belladonna ointment, may be used in case of necessity as substitutes for the more elegant, efficacious, and convenient sulphate of atropia. The ointment should be rubbed about the forehead, while the belladonna lotion may be used as an eye-wash. The object of these local remedies, upon whose use so much stress has been laid, is the dilatation of the sluggish pupil. If the pupil be not kept widely

dilated, it will fall upon the lens of the eye, and become glued to it. This will cause two serious consequences.

1. The lens will become opaque from the adherence of the coloring matter (the so-called pigment of the iris) to its transparent surface.

2. The opening and shutting of the pupil which forms so important a part of the mechanism of the eye, and which is an affair of momently occurrence, is so much interfered with by the adhesion of various parts of the circle, that the eye is always in a state of irritation, which is analogous to the irregular action of clogged machinery. For these two reasons, and for others which need not be mentioned, many an eye that has undergone inflammation of the iris, is destroyed long after the pain, redness and dread of light have disappeared.

Excessive and Constant Enlargement of the Pupil—Mydriasis.

When the pupil is constantly enlarged, so that it does not dilate and contract, it may be a symptom of various diseases. The chief cause, however, is a paralysis of the branch of the third nerve, which starts from the brain, and which has much to do with the motions of the eye. (See Anatomy of the Eye.) It sends off one branch to the muscle which contracts the pupil. Of course, a disease sufficient to destroy its power, will render the muscle unable to do its work. Dilatation of the pupil often occurs in connection with paralysis of the branch of the third cranial nerve supplying the upper lid, so that the lid drops down and cannot be lifted (*ptosis*). Affections of these nerves are often caused by syphilis, but the breaking of a blood-vessel, and a pressure upon the course or origin of the nerve, is also a not uncommon cause of this kind of paralysis. Certain drugs, such as hyoscyamus, belladonna, and stramonium, have a remarkable power in causing dilatation of the pupil. They are used by physicians as applications to the eye, especially the different preparations of belladonna. Persons wishing to simulate disease sometimes use these drugs for the purpose of deception.

Contraction of the Pupil—Myosis.

This is also a symptom of paralysis of the nerve supplying the muscle that dilates the pupil, and also of certain diseases of the spinal cord. It may also be produced by the local or constant use of Calabar bean, or of opium. It is one of the marked symptoms of poisoning by the latter.

Congenital Defects of the Iris.

There are certain congenital defects of the iris which require mentioning. The iris is sometimes entirely absent. It is sometimes cleft or deficient in one part. The pupil may also be out of place, and there may be more than one pupil. These are rare defects, and they are without remedy. Not very unfrequently one iris is of a different color from the other. Where the difference is very marked, the contrast is almost a disfigurement. This difference depends upon the amount of coloring matter in the iris, and is of course not amenable to any treatment.

Cataract.

Any want of the natural transparency of the lens is called cataract, from the old idea that a veil fell down before the eye. As has been seen on a preceding page, in the Anatomy of the Eye, the lens in health is a transparent body, but disease changes this so that it becomes completely or partly opaque.

Cataract may be conveniently divided into four great classes :

1. Cataract of youth ; 2. Cataract of old age ; 3. Cataract from injury; 4. Cataract from inflammation.

Some children are born into the world with opaque lenses. The cause is probably some want of nourishment of the lens when the child is in the womb. The lens, as has been seen, depends for its support upon the surrounding parts of the eye, for it has no blood or lymph vessels of its own. Any interference with the health of the blood-vessels of the eyeball may affect the lens. When a child becomes a few months old, and does not steadily fix its eyes upon any one point when looking, we may suspect that there is either an opacity of the lens or, still worse, a disease of the retina or optic nerve. Infants of two or three months of age, however, do not fix their eyes upon any object, but roll them about with no steady gaze. A marked opacity of the lens may be detected by any good observer, for, on looking beyond the black of the pupil, the grayish-white opacity may be seen ; where, however, the opacity is not complete, the use of a lens or of the ophthalmoscope is necessary to distinguish it.

Treatment.—The only remedy for cataract is a surgical operation. No internal or external medication has as yet been discovered, which will cause an opacity of the lens to disappear. In a few very rare cases a cataract may disappear spontaneously. When a child is strong and healthy, and it is known by tests that

it can perceive light through the cataract, and hence that the retina and optic nerve are sound, it is proper to operate for the removal of the cataract. The operation usually performed in the case of young children is by means of a delicate needle, which is plunged into the capsule or envelope of the lens, so as to wound the lens-substance itself. This being done, the lens-substance escapes into the aqueous humor of the eye, swells up somewhat, but the most of it is finally absorbed, leaving the lens very much smaller, or perhaps entirely removing it. The operation is then repeated one or more times if necessary, at intervals of time that vary according to the amount of inflammation that has been set up by the operation, until finally enough of the lens has been removed to allow the rays of light to pass without interruption through the pupil.

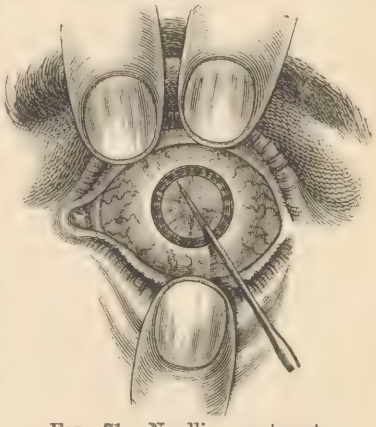

FIG. 71.—Needling a cataract.

The operation is not entirely without danger, for in some rare cases the inflammation following it is so severe as to cause the loss of the eye. As a rule, however, it gives sight.

2. *The cataract of advanced life* occurs usually after 55 years of age. Prematurely old and decayed people may be affected at an earlier period.

Inasmuch as the symptoms of cataract are similar to those from loss of sight from widely different causes, it is not worth while to enumerate them here, except that we may give a few general hints that will enable the reader to suspect the existence of cataract in given cases. True senile cataract is a painless affection. Loss of sight occurring during attacks of pain, notably neuralgia, should always excite alarm, and secure, if possible, surgical advice. Persons affected with cataract are apt, in its early stages, to see better in the twilight than in a very great illumination; whereas, in diseases of the optic nerve or retina, the greater the illumination the better the vision. Until the cataract is fully developed, when it can be seen as a whitish opacity in the pupil, only one positive proof of its existence can be furnished, and that is by the use of the ophthalmoscope—the mirror for observing the back of the eye. If a disease be cataract pure and simple, and there be no serious affection of the back of the eye, the light of a candle will always be perceived through the lens, even if it be very opaque. The

lighted candle should be seen throughout all the parts of the visual field, even if the patient be looking straight in front of him, while the light is being moved about. An eye that is sound except as to the opacity of the lens, should always be able to tell where the light is, even when the eye is looking directly forward. No eye is fit for the operation of removal of cataract that does not thus perceive the light through the opaque lens. There are diseases of the back part of the eye that finally cause opacity of the lens. Sometimes the friends of patients have mistakenly allowed such diseases to go on without an effort to check them, waiting for the cataract to become fully formed. When cataract occurs in this class of cases, it is too late to do anything to effect a cure, because the opacity of the lens is sometimes the last stage or an inflammation leading to blindness.

Treatment.—A true senile cataract may be removed by an operation which takes the lens entirely out of the eye. Formerly the lens was sometimes pushed away from the pupil by means of

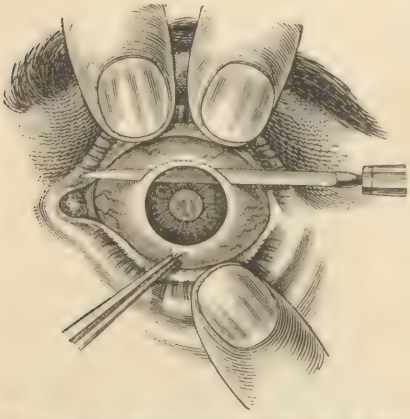

FIG. 72.—Making an opening in the cornea for the removal of cataract.

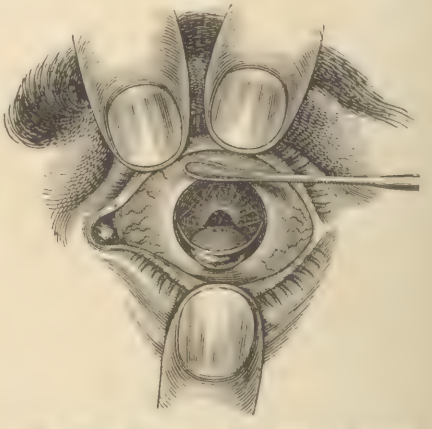

FIG. 73.—Extracting the lens in a cataract operation.

a needle passed into the eye. This operation has been abandoned by the medical profession, because the lens thus displaced sooner or later acted as a foreign body, and caused an inflammation of the eyeball which destroyed the sight. The operation of extraction was brought into general use by Beer, an Austrian surgeon. It has undergone many modifications since then, notably those suggested by the late Professor Von Graefe, of Berlin. About eighty per cent. of those operated upon by good surgeons recover useful, and some of them excellent sight.

Cataract sometimes occurs in diabetes. The results of its re-

moval in such cases are not so good as those from the removal of ordinary senile cataract.

Diseases of the Retina, the Choroid, and the Optic Nerve.

Inasmuch as none of the above-named diseases can be known positively to exist, except after the eye has been examined by the ophthalmoscope, it will not be possible to give more than an indication of their nature. Many of them were formerly grouped together under the heading of *amaurosis*, but since the ophthalmoscope has been invented—which enables the physician to detect and describe such changes in the retina as the escape of blood from its vessels, changes in its color and structure, whitening and

FIG. 74.—One of the methods of using the ophthalmoscope.

swelling of the optic nerve, rupture of the choroid coat—no such rude classification as amaurosis is adapted to these days of better knowledge. Before giving a list of the affections that may attack the back part of the eye, we may give a brief account of the invention and nature of the instrument used by physicians for examining the retina, choroid, and optic nerve.

A practicable instrument was first invented by Heinrich Helmholtz, then professor in the University of Königsberg, in Prussia, now, however, professor in Berlin. The scientific men of the world, from Aristotle down, had vainly endeavored to give a reason for the

blackness of the pupil. It was known that the lens was transparent, as also the vitreous humor (see Anatomy of the Eye), and that the choroid coat had very many blood-vessels. Why, then, was not some of the red color reflected so that it could be seen through the pupil? By accident—if there are any accidents—in one of the rooms of the Berlin University, it was discovered that if light could be made to enter the eye in a certain way, its reflection would be red, and the pupil would be no longer black. From this standpoint Professor Helmholtz proceeded, and he soon invented a mirror by which light can be thrown into the eye and caused to emerge in such a direction that the retina, choroid and optic nerve can be seen by the person holding the mirror. The eye-mirror enables the observer's eye to be in the path of the reflected rays without cutting them off, or intercepting them, as the head of the observer does, when, without the aid of artificial light and a mirror, he looks straight forward into the pupils of a person in front of him.

Scores of modifications of Helmholtz's original instrument have been made, and it is seldom or never used exactly as first invented. Yet, in spite of this, Helmholtz left no principle to be discovered when he presented his first instrument to the world, and he must always be considered as the first man who enabled us to see the optic nerve, the choroid and retina in the eye of a living subject.

Diseases of the Retina.

1. The retina may become inflamed and opaque as a result of over-use, or improper use by bad light, and as a consequence of syphilis, diabetes, and other diseases.

2. Its blood-vessels may break in consequence of a change in their walls, the result of old age, or from poisonous materials in the blood—such as are retained in the course of certain diseases of the kidney.

3. The retina may be separated from the other parts of the eye. This accident, which is a very serious one, occurs chiefly in near-sighted people. (See Short-sightedness or *Myopia*.)

4. The retina may be the seat of cancerous tumors. These chiefly occur in young children, and are sometimes not detected until the tumors have grown to such a size as to present themselves in the pupil as a whitish reflection, which may possibly, by an untrained observer, be mistaken for cataract. Removal of the whole eye before the disease has passed through the ball, is the only remedy in this desperate disease.

5. The retina may be congenitally diseased, perhaps as a result

of inflammation or arrested development before birth ; for a child in the womb is subject to disease as well as one that is born.

Such patients need a much better light than those who have a sound retina, and are, consequently, not able to get around well in the twilight or evening. Such cases are often included under the term "night-blindness."

Night-blindness is an incurable affection, yet sufferers from it do not usually become entirely blind, although they may not be able to see small objects.

Diseases of the Choroid.

The choroid coat of the eye may also be the seat of diseases similar to those affecting the retina, and from similar causes. Since it is the continuation of the iris and the ciliary body, (see Anatomy of the Eyes), it participates in most of the affections of the pupil or iris.

Diseases of the Optic Nerve.

1. The optic nerve may become inflamed ; it may suffer from the breaking of its blood-vessels, and it may shrivel or atrophy.

The Causes of these various affections are the same as those that have been enumerated under the inflammations of the retina.

2. Pressure upon the optic nerve at its origin in the brain, or in its course to the eyeball. This pressure may be caused by the breaking of a blood-vessel, by a tumor, or by inflammation of the brain.

Any considerable disease of the optic nerve must cause loss of sight, for it is by its action that the impressions of waves of light are in some unknown way carried to the brain, there to produce vision.

Diseases of the Optic Nerve and Retina from the Abuse of Alcohol, Tobacco, and so forth.

It is well known that many persons who are intemperate in the use of alcohol and tobacco suffer from what are called "weak eyes." Their eyes are red and watery. This condition is simply a form of conjunctivitis, and is not a serious matter, since a change in habit is sufficient to readily cure what is not, at the worst, any more than an inconvenience. There is, however, a form of disease of the back part of the eye from the excessive use of stimulants and narcotics so serious as to require especial men-

tion. Fortunately for the race, only a small proportion of those who are intemperate in drinking and smoking lose their sight on account of this vice.

The most prominent symptom of what is sometimes called *Tobacco Amaurosis* is a gradual loss of sight. Whenever the sight begins to fail in a person who uses tobacco in excess, especially if, at the same time, he uses strong drink freely, we may suspect the cause. The examination of the eye in these cases sometimes fails to detect any marked appearance of disease, either on the inside or outside. If the tobacco and alcohol be not given up entirely by such patients, blindness will result. Indeed, almost the only treatment necessary for loss of sight from excess in tobacco and alcohol is the total abstinence from these agents.

Very large doses of quinine sometimes, in very rare cases, produce blindness. This is usually temporary, however.

The blindness in yellow fever is one of the rare symptoms of the poisoning of the blood, or pressure upon the circulation in that disease.

Diseases of the Vitreous Humor.

Affections of the vitreous humor (see Anatomy of the Eye), are usually secondary to those of the choroid coat and retina, and are made known to the patient by the presence of motes, particles, or the like, apparently floating in front of the eye. The ophthalmoscope enables the surgeon to see these particles clearly. Sometimes they are composed of blood, of coloring matter, or of the broken-up parts making up the normal vitreous humor.

There is another kind of floating particles seen by the patient which need cause no great alarm, for they are often observed when, so to speak, they have no real existence. All these appearances of floating bodies in the eye are grouped together under the head of muscæ volitantes (*musca*, a fly, *volitare*, to fly about).

The innocent form does not cause any defect in vision, that is to say, the patient is able to see letters or objects just as well as ever. The chief annoyance is experienced in perceiving bright beads or strings floating about when the subject of them looks at a bright and clear surface. They are actually the cells of the vitreous humor, which, in some eyes not necessarily unhealthy, are seen in this manner. The appearance of floating bodies in the eye, when connected with loss of vision, or limitation of the space in which distinct vision is enjoyed, is always a serious symptom; but without these changes it need excite no apprehension.

Animal parasites have been found in the eye. Their origin is

due to eating raw meat in which the germs of these parasites existed—just as trichina and tape-worm are due to eating measly pork. An expert alone could determine the existence of such parasites in the eye, unless they are in the front—the anterior chamber. Fortunately, they are exceedingly rare. They may also exist in the eyes of animals.

Undue Hardness of the Eyeball—Glaucoma.

Glaucoma is an affection of the eye that cannot, as yet, be classified under any of the heads that have been enumerated in the account of its various diseases. Its nature is not thoroughly understood, although we have ample means for its recognition as a disease, separate and distinct from any other affection of the eye.

Since the sight may be irrecoverably lost in a few days, unless it be recognized when in an acute form, I shall attempt to impress a description of its prominent symptoms clearly upon my readers. Although I fear that I shall not succeed in causing the unprofessional reader to be able to know a case of acute glaucoma when he actually sees it, at least, I hope to be able to cause him to suspect it.

I. Glaucoma usually occurs in persons past middle life.

II. It does not often occur in short-sighted eyes.

III. Its chief symptoms are: *a.* Neuralgic pain in and about the eye; *b.* hardness of the globe of the eye; *c.* rapid loss of the power of adjusting the eye for vision, so that glasses must be changed very often in order to get those strong enough to do the required work; *d.* there are sometimes sudden and temporary attacks of blindness; *e.* the pupil of the eye is usually larger than is natural.

The name of Glaucoma, meaning "green tumor," is one given when the nature of the disease was unknown. It has no significance now, but was suggested by the greenish appearance of the pupil, which is one of the advanced symptoms of the disease, and it usually appears when the affection has made so much progress in the interior of the eye that treatment is of little avail. Something was said of this when describing cataract. There is a form of glaucoma, called chronic, in which acute neuralgic pain is absent, but where the other symptoms, especially the hardness of the globe, are present to a greater or less extent. The ophthalmoscope enables the surgeon to see that in glaucoma the pressure in the interior of the eye is so great that the entrance of the optic nerve in the ball is actually a concave instead of being a plane surface.

Treatment.—The only effectual treatment for glaucoma is that discovered by Professor Von Graefe in 1856. After investigating and experimenting on the eyes of animals, Professor Von Graefe made an incision into the eyeball of a human subject having glaucoma, and removed a piece of the iris (*iridectomy*, cutting off the iris). This operation relieved the pressure within the eye, and cured the first patient operated upon. Since that time thousands have been operated upon with benefit, in all parts of the civilized world. Of course, however, there are patients having glaucoma, for whom the operation, no matter how skilfully performed, does no good.

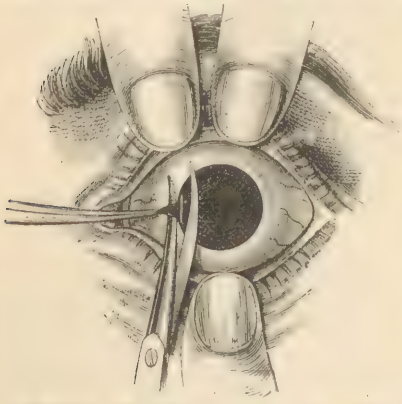

FIGURE 75.—The operation for iridectomy.

After all surgical operations, or even after every dose of medicine, the conscientious medical man may rightly say with the great Ambrose Paré, who, after treating soldiers on the field of battle, was wont to exclaim, "I have dressed you, may God cure you."

Injuries of the Eye—Foreign Bodies in the Eye.

The varying and innumerable occupations and sports of life render the eye of the human race, well as it is protected by lids and lashes, and by its position in a bony case, very much exposed to injury. From premature explosions, fragments of percussion-caps or grains of powder enter the eye. Machinists and all mechanics who work on iron, steel, or the other metals, are often struck upon the eye by bits of metal which sometimes lodge there. Even farmers at work in the harvest-field are not wholly exempt, for blades of grain may strike upon the cornea with such force as to lodge there. Children playing with a rose-bush may rub a thorn into the eye. Workmen mixing mortar, or carrying it, may splash some of the corrosive material so that it strikes the conjunctiva. Knife-makers may, by the breaking of a blade, be cut upon the eye. Children, with scissors and knives, may mutilate the organ of vision. Gunshot-wounds are received in the eye. A child, playing with its nurse or mother, may scratch the transparent front of the eye. This catalogue of injuries, which have occurred and do occur to eyes, might be almost indefinitely increased, so that we may almost assert that a large part of the

occupations of adult life, and the sports of childhood and youth expose the eyes to danger.

An injury of the eye is always a serious matter, but all injuries are not equally serious. A bit of steel in the front of the eye is often removed by a skilled fellow-workman, and a few hours' rest or protection of the eye causes the wound to heal, and the organ to be as useful as ever. Other particles, however skilfully removed, may leave a scar behind, although the patient experiences no other inconvenience. In other cases, however, the foreign body enters the cavity of the eye, whence it can only, in rare instances, be removed without injury to the globe and destruction of vision.

When the injury is a large wound, the eye is often irreparably damaged at the instant of the accident.

The most serious condition of all that have been enumerated, however, is when a foreign body left in an eye, or an injury to it, causes what is known as a sympathetic affection of the uninjured eye. There is always danger that a foreign body in the eye may cause this form of inflammation. It is, therefore, a safe rule to remove a foreign body from an eye at all hazards. Of course, the expert will find some exceptions to this rule, but the unprofessional person will not be justified in making any such.

An injury of the eyeball, especially of that region known to medical men as the ciliary region (see Anatomy of the Eye), is also, even when there is no foreign body in the eye, dangerous on account of its power of exciting sympathetic disease in the fellow eye.

Symptoms.—The prominent symptoms of sympathetic ophthalmia are:

1. Blurring of the vision, so that the subject cannot continue to read, or sew, or occupy the eyes at work on near objects, without a fatigue or watering of the eyes.

2. Inability to bear light.

When these symptoms occur in the same eye, a patient who has a foreign body in one, or who has at any period, however remote, severely injured the fellow eye, the case is most serious, and demands prompt consideration.

When it has once been decided that the injured eye is the cause of the trouble, if a foreign body remain in it, it must be at once removed, and if this do not at once arrest the trouble, the eyeball in which it was should be cut out.

In case the sympathetic trouble arise from the injury of the fellow eye, without the presence of a foreign body, the rule is also to remove the injured eyeball, in order to save its fellow. If these

early symptoms of sympathetic irritation be not carefully noted, and the affection pass on to be an inflammation of the iris and deeper parts of the eye, removal of the globe of the eye will not always, nor indeed often, arrest the disease, and the patient will become blind. Hence the necessity for the most careful attention to the early symptoms from injuries to the eye, as well as to those from foreign bodies that have entered it.

The subject of foreign bodies *upon* the eye has already been mentioned on a preceding page, and nothing more need be said as to the method of removing them. It is hardly necessary to say that none but a surgeon will endeavor, except in the direst necessity, to remove a foreign body that has fully entered the organ of vision.

Artificial Eyes.

After an eyeball has been removed by a proper surgical operation, the appearance of the patient may be much improved by the insertion of an artificial eye. These are made so beautifully of porcelain, that if inserted when the muscles that move the ball have been left, they will often almost entirely conceal the loss.

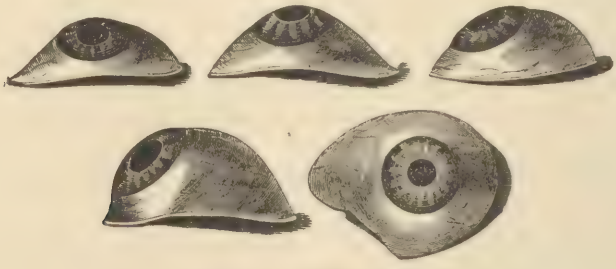

FIG. 76.—Artificial eyes.

They cannot always be worn, on account of the irritation they cause, but generally they can. These eyes cost from five to ten dollars each, and one will last with good usage from one to two years.

Cross Eyes—Squint—Strabismus.

When the muscles that cause the movements of the eyeball act together in proper accord, at every motion of the globes the lines of vision exactly agree, so that the image of the object looked upon is formed at exactly corresponding parts of the two eyes. When,

however, the muscles are unequally balanced, one eye will look in one direction, and the other in another, just as the head of a horse may be turned by his driver away from or toward his fellow, or held exactly parallel with it by the use of the guiding rein. This deviation of the eyes forms a conspicuous defect or deformity. It is chiefly seen in one of two forms : either an eye turns inward or outward. There are, however, cases where an eye turns upward or downward, although these are rare. The cause of these deviations is to be usually found in one of two influences :

1. Paralysis of the muscle of the outer side of the eye will, of course, cause it to be so overbalanced by its antagonist that the eye is turned inward. This paralysis—to go back to our illustration from the reins of a horse—is to be compared to the loss or severance of the rein on one side, while the other is still in the hands of the driver.

2. The most frequent cause of strabismus or squint, however, is not paralysis. By far the greater number of patients who turn their eyes inward or outward, use all the muscles of the eye very well, and turn the eye in any direction, but they are not able to cause the eye to be moved in such a way that they direct the line of vision to exactly the same point when the muscles are *all* in action. This may be easily tested in the following manner : Let the person to be examined close one eye, and cause him to follow the finger, a pencil, or some such object while it is moved about, above, below, to the other side. If there be no paralysis, the eye will follow all these movements without any movement of the head. If paralysis exists, however, the patient will move his head in order to get a view, and the eyeball will stop in its movement outward or inward, upward or downward, according to the muscles that are affected.

The most frequent cause of strabismus is a congenital want of development, or excess of development of the eyeball, so that one set of muscles acquires a greater power than the others. (See paragraphs on Eyes requiring Spectacles.) Thus, eyes that are too short most frequently have an inward squint, while an eye that is too long squints outward. Comparatively few, however, of the cases of insufficient, or too great focussing power of the eyes have strabismus as a result, so that we are led to conclude that other factors have much to do in causing the deformity. Eyes that are too short require convex glasses, but one eye may need a stronger one than the other. They are more apt to deviate than those that are of the same length, or, to state it more technically, that have the same refractive power. A disease such as cataract or opacity of the cornea, affecting one eye, and preventing the

use of the two eyes at the same time, assists in causing strabismus.

A deviation of the eye inward is usually associated with want of focussing power, or with an eye that is too short from before backward—the so-called hypermetropic eye. It is usually first seen in children when they have reached three years of age, or when they begin to fix their eyes upon comparatively small objects, such as their toys. Thus mothers constantly affirm that their children did not squint when they were born. They are correct, but most of these children who afterward squint, would have done so immediately after birth had they the power to look at objects fixedly or intently. Any one who has observed the habits of infants and young children will remember that fixing the gaze upon a near object requires considerable use of the muscles that pull the eyes inward, and that it is an acquirement just as much as learning to walk. It is when the eyes are continuously used in this manner that the squint is observed. Sometimes it is not constant at first, but periodic; it usually, however, soon becomes fixed.

Both eyes commonly squint in convergent strabismus, although one much more frequently does so. In other words, one eye squints by preference, while the other is used for seeing. For some unknown reason, the vision of the eye that generally squints becomes blunted. The use of tests, such as type, generally shows that the squinting eye does not have nearly as good visual power as the other. Thus, we often find that the patient is only able to see large objects with the eye that deviates. Yet the most exact observation of the optic nerve or retina does not always, or usually, find any reason for this loss of vision. It is a happy thing for the squinting patient that the vision does thus become blunted. Were it not so, he would see all objects doubled. Double vision is one of the most distressing of symptoms, and although usually observed in strabismus from paralysis of the muscles, is seldom found in the strabismus arising from an improper shape of the eyes.

Treatment.—The treatment of strabismus depending upon paralysis has already been dwelt upon in speaking of that subject. It will be sufficient to say here, that the cause must be sought out, and if the affection be not of too old a date, it may often be relieved by appropriate internal treatment. Strabismus depending upon a faulty shape of the eyeball—which is, so to speak, a local disease—can only be remedied by an operation. Some writers contend that the continued use of sulphate of atropia, which suspends the power of accommodating the eye to different distances, may in time, with the use of the appropriate glasses,

cure the deviation, but the present writer has not been convinced by the reports as yet made of the success of this treatment.

The operation for the relief of strabismus consists in separating the squinting muscle from the attachment to the globe of the eye. It then grows again to the eye, but at a point farther back, so that its power over the eyeball is reduced. It is usually necessary to operate upon each eye, although not always, and sometimes more than once on the same eye. They are generally not operated upon at the same time, but the effect is carefully watched after the first operation. The operation for squint is quite painful, and is usually performed while the patient is under the influence of an anæsthetic. After the operation, the want of vision of the eye should sometimes be corrected by the use of the proper glasses.

Paralysis of the Muscles of the Eyeball.

This affection is not always so strongly marked as to cause any deformity. The eyes may, to all ordinary observation, seem to be perfect in their associated movements, and yet one or more of their muscles may be paralyzed. The patient, however, will most keenly feel even the slightest deviation. If the two eyes are not acting in exact harmony with each other, a most troublesome double vision will occur. The slighter the deviation, the greater will be the annoyance ; hence a paralysis that can only be detected by very fine tests will often cause a distressing double vision.

Any, or even all of the muscles of the eye may be paralyzed. The most frequent cases are those in which the eyelid droops, the pupil is dilated, and the eyeball turns outward. All these parts are apt to be paralyzed at the same time, because one nerve (the third of the nerves going out from the base of the brain) supplies these parts. The eye may turn in from paralysis of the nerve supplying the muscle that draws the eye outward, or the lid may refuse to shut from paralysis of the circular muscle, which closes the lids.

The Treatment of any of these, or other forms of paralysis, depends upon the cause. Among the prominent causes are syphilis, tumors of the brain, rheumatism, pressure upon the trunks of nerves from blood-clots, pieces of bone that have been broken, etc.

Constant Oscillatory Movement of the Eyes—Nystagmus.

This symptom is seen very frequently in Albinos. The eyeballs are never quiet, at least in working hours, but are constantly being moved about, as if in search of some object upon which to rest. The affection is caused by various diseases of the

eye, which prevent the formation of a sharp image upon the retina. The patient is not able to get a sharp, well-defined image at any point. He is like a person looking through an improperly focussed opera-glass, which he is not able to adjust. It is probable that the habit of moving the eyeball in all directions is induced by the attempt to gain clear vision. The affections causing nystagmus are usually incurable. Some of them are want of development and wasting of the retina, dense opacities of the cornea, congenital cataract, want of development of the whole eyeball, etc. Miners who spend much of their time entirely deprived of sunlight, sometimes become affected with nystagmus. This fact helps materially to explain its cause. It would seem to arise from the want of sufficient illumination to view any one object with distinctness. One author believes that nystagmus occurs in consequence of the prolonged looking upward required in mining. It is also said to be a symptom of some diseases of the spinal cord.

Inability to Use the Eyes Continuously when there is no Inflammation and no Lessening of the Sharpness of Sight.

There is a troublesome combination of symptoms, grouped by physicians under the general head of Asthenopia, or weak-sight, that usually depends upon the failure to wear glasses when they are required. It will be fully discussed under the head of Spectacles.

There are, however, some cases in which general muscular debility, diseases of the other parts of the body, notably of the womb, cause what is called a reflex disease, and prevent the patient from any prolonged use of the eyes. A careful examination of the eye as regards its need for glasses should always be had, however, before a case is declared to be one depending upon general debility or organic disease of another part of the body. The results of the scientific investigations of the past twenty years, by showing the true use of spectacles, have rescued thousands of condemned eyes from inactivity and uselessness. Asthenopia depending upon constitutional causes, chiefly requires of course constitutional treatment.

Conditions of the Eye requiring the Use of Spectacles.

The history of the invention of spectacles still remains in much obscurity. After the art of making glass was discovered, lenses were soon made, and were used as burning glasses. Aristophanes (B.C. 424) alludes to them in his comedy of the "Clouds." It is said

that the vestal virgins used convex lenses to kindle the sacred fire, and surgeons also employed them as actual cauterants. Seneca (A.D. 65) noticed the magnifying power of a bottle of glass in enlarging small letters. Roger Bacon, or Friar Bacon, born in 1214, certainly knew something of spectacles, if he has no claim to be their inventor, for a writer, in 1551, thus speaks of a "glasse" used by Friar Bacon: "Great talke there is of a glasse he made at Oxford, in which men might see things that weare don, and that were indulged to be don by power of Evile Spirites." And in his own writings Bacon says, "This instrument (a plano-convex glass, or large segment of a sphere) is useful to old men, and to those that have weak eyes, for they may see the smallest letters sufficiently magnified." It is probable that they were in use at the time of his death in 1292, whether Bacon knew about spectacles himself or not.

Alexander de Spina, a native of Pisa, who died in that city in 1313, having seen a pair of spectacles that were made by another person, who was unwilling to make his method known, caused a pair to be made for himself, and then, in a liberal spirit, made his invention public. On the tomb of a Florentine nobleman, who died in 1317, it is said that he whom the stone commemorates was the inventor of spectacles. The spectacles thus invented, however, were those to be used by old persons. Thus their value was limited to a relatively small class. Our time has largely amplified the variety of assistances to read, so that young and old now derive advantage from the great discovery of the uses of glass as means of assisting the sight.

The eyes that require and are benefited by spectacles, may be divided into three great classes. There are subdivisions of these classes, but in order to simplify discussion I will first speak only of these chief varieties of eyes:

1. *The Far-sighted Eye of Old Age.*

This is an eye that has become practically too short—an eye with an insufficient focussing power (*presbyopia*).

2. *The Far-sighted Eye of Youth.*

The eye that is actually and congenitally too short from before backward (*Hypermetropia* or *Hyperopia*).

3. *The Near-sighted Eye.*

Or the eye that is too long from before backward (*Myopia*).

This classification is no artificial one. It does not depend upon the dogmatic assertion of medical theorists, but upon the anatom-

ical structure of the eye, and the inevitable processes of decay in human strength, and has been determined by accurate investigation and experience.

While we are indebted to a long line of scientific worthies for the gradual progress which has finally enabled us to discriminate as to the kind of spectacles which should be worn in different cases, to Dr. F. C. Donders, Professor of Physiology in the University of Utrecht, belongs the honor of having arranged the whole subject, enriched by very many of his own investigations, in an harmonious whole. His great work on the Refraction and Accommodation of the Eye, was first written in the Dutch language, but it has been translated into the English and German, and is everywhere recognized as the highest authority on the subject of which it treats. The views that are here presented are mainly derived from this work.

Presbyobia.

The eye of old age requires spectacles ; not because the cornea —the anterior transparent coat of the eye—becomes flattened in advanced life as is often said, but because a little muscle within the eyeball, called by anatomists the ciliary muscle (see Anatomy of the Eye) loses some of its power as old age comes on. This little muscle

FIGURE 77.—Sections showing : I. the normal eye ; II. the myopic one ; III. the hyperopic.

passes around the eyeball and connects the cornea and iris to the choroid coat and to the ligament which holds the lens in position. The vigor or tone of this muscle becomes impaired with advancing years. Its ordinary work is that of making the lens of the eye thicker than it is when the eye is in a state of rest. The rays of light coming from a near object—from the page we are now reading, for instance—have a divergent course ; they are continually going away from each other ; when they come from an object much further off they are parallel or nearly so. Thus the rays from the music on a piano do not come to the eye of the player

as divergently as those from her sewing, which is held nearer than the music, and the further the illuminated object is removed the less divergent, the nearer parallel the rays become. In every act of changing our gaze from a remote object to a near one, the lens of the eye becomes thicker ; in other words, during the act of accommodating the vision for a near object. It must then be relaxed, become thinner, in turning one's eyes from an object near at hand to one that is far removed. The lens also loses some of its natural elasticity with advancing age. It can no longer undergo this alternate change with the same readiness as in youth. Thus we have two factors, both acting *within* and *not without* the eyeball, that impair the adjusting power of the eye. No eye-cups to lengthen the ball, no process of straining upon the eye, will ever be of any but the most harmful assistance in attempting to overcome these natural and senile changes.

The small object which the man of fifty desires to see, is held further off than when he was thirty, because he can then have the benefit of rays of light that are less divergent than those coming from it when it is very near him. They will then, of course, not require so thick a lens to unite them to a distinct image upon the retina. The little, enfeebled ciliary muscle will not be required to do as much work. That work has been constantly done, except during sleep, ever since our baby-eyes began to look wonderingly from the rattle to mamma's face. As we turned from the book we were reading to the landscape before us, in all the multifarious employments of life which require a different adjustment of vision, the ciliary muscle has become alternately tense and relaxed, the lens increased and lessened in size. The vigor of the muscle is at last impaired, the faithful servant has become feeble with age.

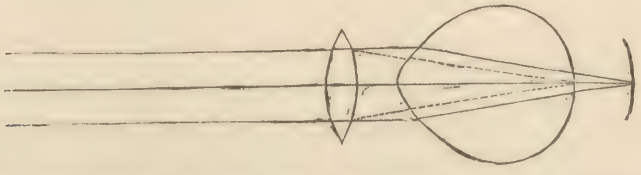

FIGURE 78.—Showing the action of a convex lens placed in front of an eye that is too short. The dotted lines show the increased convergence caused by the lens.

The great invention of spectacles is now made available to restore the lost equilibrium. There is not enough power for the work demanded. A double convex lens, just such an one in shape as the one inside the eye, is placed outside of it, in front of it, in a spectacle frame. The lens within the eye is thus practically made thicker, and the book may be held at the old and proper distance. Perhaps

the reader has sometimes wondered why old persons lift up their spectacles or remove them when they turn from a book or newspaper to the face of some one with whom they wish to converse. By remembering what has above been said about the rays of light being the less divergent the farther off the object from which they come, and that the lens requires to be made thicker in proportion to the nearness of the object, this will be easily understood. The old people who are to be seen working without glasses, were born with an eyeball which is too long. The senile changes which tend to shorten the eye are then counterbalanced or neutralized by the congenital malformation. This is probably the explanation of such cases as those of Cicero, Humboldt, and John Quincy Adams, which are sometimes adduced as evidences that old eyes may not need glasses. Professor Donders thinks that the most useful eye is one that is somewhat short-sighted, for the reason that in advanced life glasses need not be used for reading and writing by such persons. These subjects are apt to boast of the superiority of their eyesight over that of their neighbors. If we place a weak concave lens before their eye, we can soon convince them that they can see objects at a distance better with than without its aid. The superiority of their vision, then, is limited to near objects. As a general rule, glasses are required for reading, writing, or the like, by all people who are not near-sighted, after the age of forty-five. Those who are born with eyeballs that are too short (hyperopes), will often require them at a much earlier period. Short-sighted people go on until fifty or sixty years of age, or even entirely through the three score years and ten, without needing glasses to read with. But it is an error to suppose that the vision of near-sighted people improves for distant objects as life advances.

Hyperopia.

Eyes that are congenitally too short require glasses. This state of arrested development includes quite a large proportion of human eyes. Many eyes never suffer inconvenience from the defect, and are able to do their work, until the far-sightedness of age occurs, without glasses. To very many, however, in whom the defect occurs, the inconvenience is so great that no continuous work with the eyes is possible, unless provided with spectacles. The researches of Donders were a great boon, for, supported by his investigations, physicians began to prescribe their use to thousands who had been before denied them. Until Donders clearly demonstrated the anatomical condition at the base of the want of vision of this class, their fate was sad indeed. They were deemed un-

fortunates who had the eyes of old people, but to whom it was dangerous to give glasses, or, still worse, they were considered as victims of incipient blindness, which could only be warded off by the most vigorous anti-inflammatory regimen. Such patients were often confined to darkened rooms, cupped, blistered, and salivated; in short, they were in many instances the victims of actual martyrdom. The only source of relief — that is, the use of convex glasses—was absolutely prohibited, lest the weakness of sight should end in complete blindness.

Those who did not suffer from actual treatment for the unknown, anatomical condition, were often denied the privilege of using their eyes, and in England were advised to enter upon such employments as sheep-farming in Australia, while in other countries similar uncongenial occupations were often urged upon those who, with the aid of glasses, could have been successful in chosen occupations.

The discovery that hyperopic patients, even when young, should wear glasses, and that many did actually put them on, without medical advice, much to their benefit, was made in 1848 or 1849, by Professor Chester Dewey, then in Union College. He published his observations in Silliman's Journal, Vol. VIII., p. 443, but they escaped the notice of physicians. Hence the United States lost the priority in proclaiming relief to a large class of sufferers.

It was found by the ophthalmoscope that this class of eyes, now under consideration, were too short. Hence, both divergent and parallel rays would only come to a focus or unite behind the retina. The loss or indistinctness of sight was explained. In convex glasses, which would make this eyeball, which was too short, of the proper length, a remedy was found. There were no evil consequences to be feared from their use, since their effect was purely mechanical, just as we have seen is the case in the use of glasses for presbyopia. There are several grades of this congenital shortness of the eyeball. In a large proportion of cases, as has been said, no glasses are required, because the patient can overcome the defect by a very slight extra and unconscious muscular effort. There are some cases, however, where the patient cannot see any small type without glasses, nor can he see objects at a distance. These cases should have glasses as soon as the defect is discovered.

There is a larger class who can see for a very short time while looking at near objects, but whose eyes are soon tired, and incapable of an ordinary amount of work. This class also should wear glasses. There are other subdivisions of this defect. It is only

necessary to repeat what was said when treating of asthenopia or weak sight: that all cases of inability to continue to use the eyes for a reasonable time, should be carefully examined as to whether or not they require glasses. Much of the development of a child's character may depend upon its ability to use its eyes in a proper way and for the proper length of time. Far- and short-sightedness, uncorrected, may cause many defects more serious than the mere inability to see.

Myopia.

Short-sighted eyes, or those which are too long from before backward, require spectacles. This condition is one in which some patients are born. More, however, induce it by improper habits, which interfere with correct vision. It is a defect more common in Germany, probably, than in any country. If generation after generation overwork their eyes under improper conditions of diet, illumination, character of type, and so forth, a race of near-sighted people, or people who very easily become near-sighted, will be at last produced. This has occurred in the cultivated classes in Germany, and is occurring in the United States to an increasing extent.

Short-sighted persons do not usually need glasses for reading or writing, for the very simple reason that divergent rays of light are easily brought to a focus on a retina which is situated further back than it should be. Very little tension is required of their muscle of accommodation in uniting those rays. But in looking at a distance, when the rays of light which strike the eye are parallel, they have trouble. Do what they will, they cannot unite such rays to a distinct image on the retina. They unite in front of it.

The reader will remember that his short-sighted acquaintances cannot read signs; that they do not know their friends on the other side of the street; in short, they do not see things that are somewhat removed, unless they have their glasses on.

A concave lens, as we all know, disperses rays of light, producing just the opposite effect of a convex one, which collects them. Parallel rays are thus changed into those that are divergent. When a concave lens is placed before the eye, the eyeball is, in effect, shortened,—made to approximate one of the proper length.

Any one who has normal eyes, who would like to know how indistinctly short-sighted persons see objects at a distance without concave glasses, should step into an optician's, and put himself in their position, by putting on convex glasses, which will make his

eye too long. He may, after doing this, also experience the gratification of a short-sighted person, when he puts on correcting spectacles, and looks out on a world of beauty, which he sees distinctly for the first time. This latter will be done by neutralizing

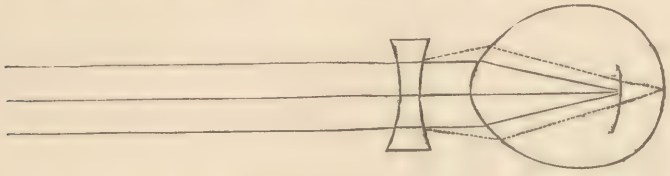

FIGURE 79.—Showing the effect of a double concave lens in dispersing the rays of light so as to focus them on the retina of an eye, the axis of which is too long.

the concave glasses by convex ones of the same focal distance. The experimenter has thus done what the oculist does for a short-sighted patient. The effect that is produced is purely mechanical, both in the eye naturally short-sighted, and the one artificially made so.

So far from the use of proper glasses being an injury to such patients, they are a positive benefit. A neglect to wear spectacles when the circumstances require them, will sometimes cause one eye to turn outward, and thus cause deformity. The short-sighted eye is essentially a diseased eye, and great care is required in its management; but spectacles rightly used assist in preserving its functions.

In the introductory part of this section, great stress was laid upon the necessity of a proper arrangement of the school desks of children, the illumination of objects, the clearness of the type, and so forth. It is a neglect of these precautions, as well as a failure to secure a proper amount of out-of-door life, good food, and all the other influences necessary to maintain a sound body and a vigorous muscular system, which lead, among other defects, to a softened and elongated eyeball—in other words, to short-sightedness.

It must be constantly remembered, that while far-sightedness from age is inevitable, and while the short eyeball of youth is a condition with which many are born, short-sightedness is not only often entirely acquired, but is also alarmingly increased by improper habits. Hence, many of the warnings as to the misuse of eyes.

Astigmatism.

As was said, there are defects requiring the use of spectacles other than those described under the three heads that have been discussed. The chief of these is *astigmatism*, from two words meaning not coming to a focus. Astigmatism may always be resolved into hyperopia or myopia, or into both. There is hyperopic astigmatism, myopic astigmatism, as well as a mixed form, in which the two forms of the defect are combined in one eye. This condition depends upon a defect in the shape of the eyes, just as do hypermetropia (the far-sightedness of youth) and short-sightedness. There is a want of symmetry in the refracting parts of the eye. Besides being a congenital condition, it is sometimes acquired from inflammation of the cornea. When astigmatism exists, one part of the eye may be of the normal shape, while another is far- or short-sighted; or the whole eye may be of improper length, although one part is more defective than the other.

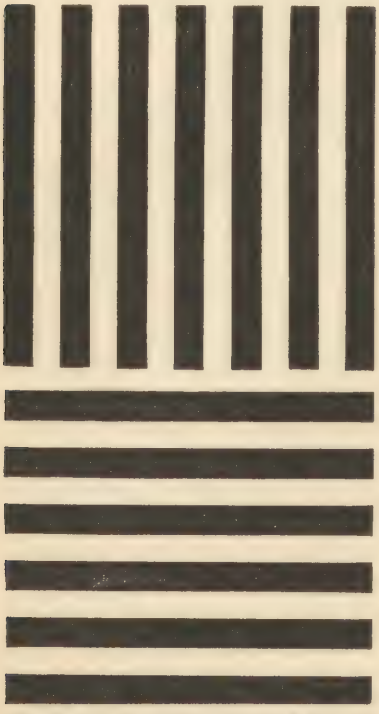

FIGURE 80.—Arrangement of lines to test the existence of astigmatism.

The troubles caused by this defect are more considerable than those caused by far- or short-sightedness. Patients see all objects distorted, and none of them clearly or for any length of time without fatigue. Yet persons suffering from these inconveniences often go on to adult life without knowing that their vision is remarkably defective, and sometimes they recognize that it is without being aware that there is a remedy.

Exact examinations generally show that astigmatic persons see horizontal lines much better than those that are vertical or the reverse. A test made with such lines as are represented in the accompanying woodcut will often detect astigmatism. Astigmatic patients, if ladies, are apt to indicate it by their inability to put on their neckties, and so forth, correctly, and such persons have been known to go about straightening pictures that were already properly hung.

Although there were isolated cases of correction of this defect by the use of glasses, notably the case of Airy, the celebrated astronomer, it was not until the time of Donders that physicians were enabled everywhere to correct it by glasses ground from a cylinder. The ordinary convex and concave glasses are ground from a sphere. It is probable that this defect, if uncorrected, has more effect upon the development of character, than either of the simpler forms of improperly-shaped eyes.

Color Blindness.

In this affection the patient is not able to properly distinguish all the colors of the spectrum. It is sometimes called Daltonism, from John Dalton, who first described it in 1794. Persons having this defect are usually born with it, although it is sometimes the result of disease of the optic nerve. Color-blind persons may not be able to distinguish red, or green, or violet, or they may be totally color blind, and may only perceive the form of objects.

Color blindness is more common in males than in females. One in twenty-five of males are said to suffer in some degree from this defect, while not quite one in a hundred of females are color blind. There is no remedy for this trouble. It is a very dangerous one when it occurs in men employed in running railway trains or ships, for they are not able to positively distinguish the color of the signals. In many countries and in some parts of our own, measures are being taken to secure an examination of all the railway engineers and switchmen. The best test for the detection of color blindness is that by means of colored worsteds. Those to be tested are caused to match the red, green, or violet, by means of the hundreds of various tints that are given them to select from. If color blindness exists, his inability to match one or more of the three colors will soon be shown. The color in which a person is blind seems to be gray to him.

Simulated Blindness.

For various reasons young persons and even adults sometimes falsely assert that they cannot see with one or both eyes. An inexperienced person will have difficulty in detecting this deception. The physician, however, by means of the ophthalmoscope and certain ingenious tests, is generally able to do so.

Hysterical Blindness.

There is a form of hysteria in which blindness is one of the symptoms. There is usually a basis for this simulation in a moderate defect in vision which the disease of the nervous system causes the patient to exaggerate. The treatment of hysteria will, of course, serve also to remove the trouble. It is very important, however, to act upon the mind of the patient by correcting, as far as possible, any real defect in sight that may exist.

D. B. ST. JOHN ROOSA, M.D.

THE EAR AND ITS DISEASES.

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VOL. II.—20

THE EAR.

In a treatise like this it seems desirable that the chapter relating to the ear should furnish information on the following three points: 1. The anatomy and physiology of the ear. 2. The more common ailments to which this organ is liable; and 3. The means which a non-professional person may properly employ to relieve these ailments.

For practical reasons, these last two subjects will be discussed under a single head.

The ear is composed essentially of three parts, called respectively the outer, the middle, and the inner ear. The outer ear comprises not only the *auricle*—that outer portion which can be grasped with the hand, and whose configuration is familiar to everybody, but also the *external auditory canal*—a tubular passage, about an inch in length by a quarter of an inch (or more) in diameter in the adult. This passage is lined with skin throughout its entire length, but while in the outer half of the canal the skin is very thick and not at all sensitive, throughout the inner half it is very thin and highly sensitive. (Fig. 81.) There is also another difference between the two parts of the canal. In the outer half there are numerous little side channels or glands (ceruminous glands) that pour forth a clear yellowish fluid, which, on exposure to the air, soon becomes converted into a pasty substance known under the name of *ear wax*. In the inner half of the passage there are only a few of these

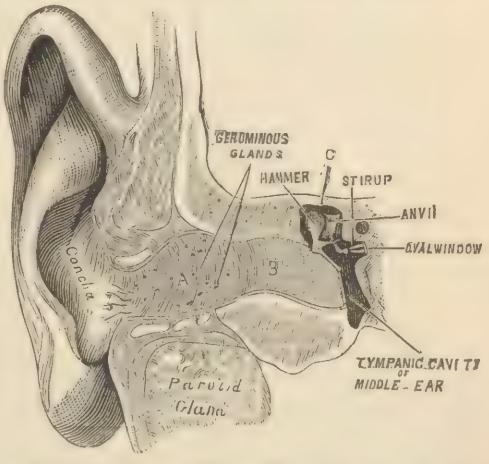

FIGURE 81. — (After HEITZMANN). — Section through the external auditory canal and the tympanic cavity, or middle ear. A, the cartilaginous portion of the external auditory canal, in which the ceruminous glands are the most numerous. B, the bony portion of this canal. C, the thin wall of bone separating the cavity of the middle ear from the brain cavity above.

glands. This passage, furthermore, lies very close to the joint of the jaw, so that in earache one is very apt to experience pain whenever the mouth is opened, or attempts at chewing are made. Finally, in its deeper half this passage is separated from the brain-cavity above by a spongy plate of bone of variable thickness.

The *middle ear* (or drum cavity) is a small cavity situated just beyond (as we proceed inwards) the deeper extremity of the external auditory canal; the two are, in fact, separated only by a very thin membrane—the *drum membrane*, or *membrana tympani*. The cavity of the middle ear is so small that probably five or six drops

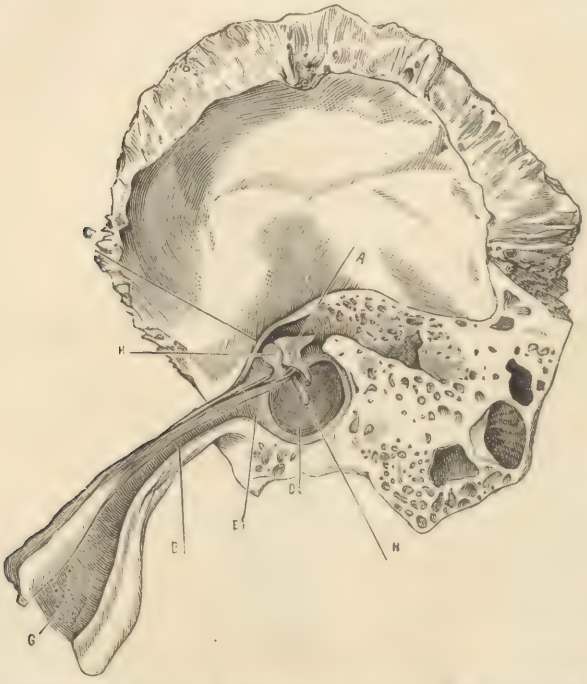

FIGURE 82.—(After HEITZMANN).—Section through the base of the temporal bone. A, rests over the smooth inner surface of the temporal bone, and indicates, by the straight line, the anvil bone. E, the tympanic orifice, and B, the central narrow portion of the Eustachian tube (divided lengthwise). C, the thin wall of bone separating the cavity of the middle ear from the brain cavity above. D, the drum membrane. G, the mucous glands at the opening of the Eustachian tube into the throat. H, the malleus, or hammer-bone. The cavities seen in the bone at the lower right side are the mastoid cells.

of water would completely fill it. On all sides, except where it is separated from the external auditory canal by the drum membrane, it is surrounded by walls of bone. In the forward part of the cavity is the opening to a small passage-way, which leads downward and forward into the back part of the nose. This passage way is called the *Eustachian tube*. In the hinder part of

the middle ear is another opening, larger than the first, which leads into a small cavity, and then through a countless number of minute openings, into a complete labyrinth of bony cavities, called the *mastoid cells*. This aggregation of cavities, some as large as a buck-shot, others no larger than a millet seed, are contained within that rounded mass of bone which one can readily

FIGURE 83.—(After RÜDINGER).—Section through the head, showing the relations of the aural cavities and the Eustachian tubes: 1, Cartilage of external auditory canal. 2, Bony portion of external auditory canal. 3, 4, Drum membrane of the right side. 5, Cavity of the middle ear. 6, Dilator muscle of the Eustachian tube. 7, 13, Muscles which lift the soft palate. 8, Mucous membrane of the pharyngeal orifice of the tube. 9, Drum-membrane of the left side. 10, Hammer. 11, Muscle which renders the drum membrane tense. 12, Mucous membrane of the Eustachian tube. 14, 15, Mucous membrane of the posterior surface of the pharynx.

distinguish immediately behind the auricle. The floor of the middle ear is composed of pretty thick, solid bone, while the roof consists of a very thin plate of bone, on the other side of which lies the brain with its enveloping membranes. (See Fig. 83.)

This close proximity of the brain to the drum cavity and to the external auditory canal furnishes an explanation of the fact that now and then an ordinary inflammation of the ear passes gradually into an inflammation of the brain, and destroys life.

In the centre of the drum cavity is suspended a mechanism consisting of three little bones or ossicles, called respectively the *hammer*, the *anvil*, and the *stirrup*. The first of these—the hammer—is firmly united with the drum-membrane, and is able, by reason of the looseness of its other attachments (to the surrounding bony walls), to follow every movement communicated to the drum-membrane. The last of this series of ossicles of hearing is the stirrup, so called from its perfect resemblance to an ordinary stirrup. This little bone is fastened like a piston in one of the two openings that lead from the drum cavity (or *middle* ear) to the inner ear. (See Fig. 85.) Finally, between these two bones, and firmly connected with each of them, is suspended the anvil. This little bone is joined to each of the other two in such a manner that an impulse communicated to the hammer will be taken up by the anvil, and by it be transmitted to the stirrup in the form of a piston motion, driving its foot-plate into the cavity of the inner ear or *labyrinth*.

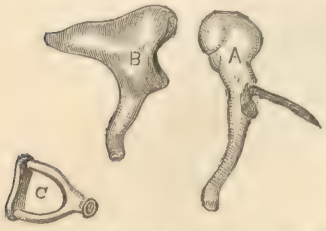

FIGURE 84.—The three bones of the middle ear (magnified). A, the hammer. B, the anvil. C, the stirrup.

The latter cavity is well-named, for in no other part of the body, not even in the eye, do we find such an intricate system of cavities, channels, and structures.

The labyrinth is composed of three cavities, or systems of cavities, surrounded on all sides by very dense, bony walls. Two of these cavities—the *semi-circular canals* and the *vestibule*—need not detain us, as we know little or nothing concerning the part which they play in the act of hearing. The third cavity, which from its close resemblance to a snail is called the *cochlea*, contains thousands of delicate cords, in regard to which it may safely be said that they vibrate in sympathy with the countless shades of sound which daily penetrate the

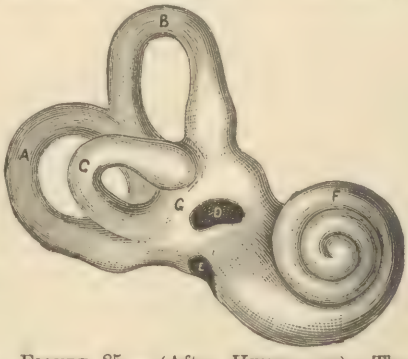

FIGURE 85. — (After HEITZMANN).—The labyrinth as it appears after its walls have been separated from the bone in which it is embedded (greatly magnified). A, B, C, the semicircular canals. D, the oval window. E, the round window. F, the cochlea. G, the vestibule.

ear. From these tensely stretched cords nerve-filaments run to the brain, and in some unknown manner convey the sensations of sound. (See Fig. 87.)

The series of shocks into which sound may be analyzed, first cause the drum membrane to perform a corresponding series of to-and-fro vibrations. The hammer, from its intimate union with

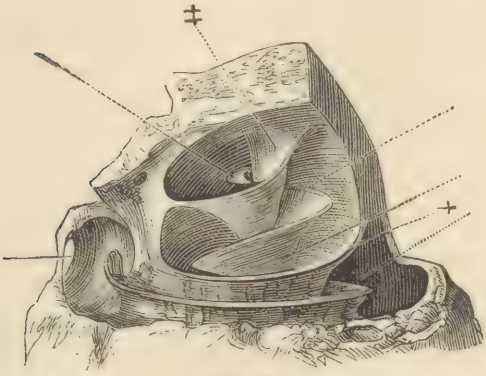

Fig. 86.

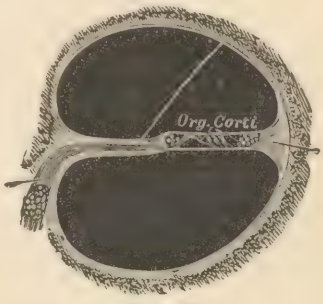

Fig. 87.

Figure 86.—Section (magnified) through the cochlea, showing the spiral arrangement of its canals. A, A, represent the bony partition which nearly divides the canal into an upper and a lower portion; the balance of the partition, extending from the margin B, B, to the wall of the canal, being composed mainly of nerve-fibres and the organ of Corti. C, the oval window into which the foot of the stirrup-bone fits.

Figure 87.—(After Heitzmann).—Section, greatly magnified, across the canal of the cochlea. A, branch of the nerve of hearing. Between A and B is a partition composed in part of bone and in part of a tensely stretched membrane (the basilar membrane), which gives support to the organ of Corti. The nerve-fibres terminate in the latter organ.

the drum membrane, performs the same vibrations, and, as already stated, transmits them to the anvil, and thence to the stirrup.

It is very generally believed that if the drum-membrane become destroyed (either wholly or in part), the power of hearing will be lost. This is an error. The same shocks which cause vibrations of the drum-membrane, may also, in the absence of the latter, cause similar vibrations of the stirrup. As the vibrations of the drum-membrane must reach the labyrinth (and the countless cords contained therein) through the intervention of the stirrup, so can the latter bone vibrate independently of the drum-membrane and the other two ossicles—in *direct* response to the shocks communicated by the waves of sound. This mode of transmission of sound is not so perfect, as a matter of course, as that which Nature has provided, and hence the hearing power in an ear deprived of its drum-membrane is correspondingly imperfect.

DISEASES OF THE EAR.

The ear, being a complex organ—composed in part of bone, in part of skin, and in part of mucous membrane—is liable to all the diseases which affect these three different tissues. To enumerate all these diseases and to describe their several peculiarities, would not be in harmony with the aim of this treatise. Furthermore, the suffering patient cares very little whether his disease be called by this, that, or the other scientific term ; he simply knows what his *symptoms* are, and desires to be relieved of these. It is of *symptoms* chiefly, therefore, that I shall speak in the present section. The necessity for such a course will be at once apparent if we take into consideration the fact that the greater, or at least the more important portion of the ear cannot be seen except with the aid of instruments specially adapted for the purpose. One can therefore readily understand how few of the affections of this organ can be accurately distinguished, much less properly treated by any person who does not possess these instruments and the necessary skill to use them.

Deafness.

Deafness is probably the symptom concerning which patients are most anxious to ascertain information.

If it develops suddenly in a healthy person, without pain or unpleasant ringing noises, the most probable cause is the blocking-up of the external auditory canal with hardened wax. This is very apt to happen after a bath. Water enters the canal, softens the mass of wax, and causes it to fill the canal as tightly as would a cork. After the removal of the wax, the hearing returns.

If it develops gradually, while the person is suffering from a "cold in the head," and is associated with ringing in the ear and perhaps occasional shooting pains, the cause is most likely to be a mild form of inflammation of the middle ear or drum cavity, due to an extension of the process known as a "cold in the head," up through the Eustachian tube to the middle ear. Unpleasant sensations in the ear and more or less deafness usually remain for several days, and then gradually disappear without leaving any impairment of hearing. Beyond the avoidance of exposure to draughts of air and sudden changes of temperature, no special treatment is necessary.

If it develops slowly without any other symptoms (except possibly that of ringing in the ear), and is not discovered by the pa-

tient or his friends until it has already become pretty well marked, the cause is probably that insidious process which we term "chronic catarrh of the middle ear," but the exact nature of which is not clearly understood. In these cases even the aurist very rarely succeeds in improving the patient's hearing by treatment. As the catarrhal process in the ear, however, is apt to be dependent upon a similar condition of the upper part of the throat, the further progress of the trouble may be arrested by making suitable applications to this region. These are the cases which fall an easy prey to the advertising quack. The regular practitioner of medicine fails to afford the sufferer any relief, and probably dismisses the case as incurable. The quack promises a speedy cure, and the patient—ready to spend any amount of money to recover his lost hearing—very naturally puts faith in this new adviser.

If it develops suddenly or quite rapidly during convalescence from cerebro-spinal meningitis (or brain-fever), scarlet fever, typhoid fever, measles, or small-pox, without other marked symptoms referable to the ear, the cause is probably an escape of blood into that portion of the labyrinth which is called the cochlea. Very little is known about these cases of labyrinthine ear disease beyond the fact that the loss of hearing is almost always permanent. No form of treatment is known to be of any use. On the other hand, as young children are most apt to be the subjects of this malady, it is important to take early steps for the preservation of the power of intelligible speech, which, without special efforts on the part of parents or instructors, would very soon be lost.

If the deafness develops as the immediate result of a fall or blow upon the head, the cause is probably either a rupture of a blood vessel in the cochlea (see Fig. 86), or a dislocation (or rupture) of the delicate cords contained in that cavity. Here, again, the loss of hearing is more than likely to be permanent. The next most important symptom of which patients complain is generally

Earache.

As non-professional persons can treat the symptom only, irrespective of the exact nature of the cause, I shall confine myself to a statement of the great importance of this symptom as a warning of impending danger. In by far the greater number of instances, an earache will run its course without serious detriment to the health of the patient or noticeable damage to his power of hearing. In quite a large minority, however, the earache is simply the first stage of a severe inflammation of the middle ear—an inflam-

mation which, if not checked during this first stage, may go on to the total destruction of the drum-head, to the establishment of a chronic process of ulceration, rendering the patient offensive (by reason of the disagreeable odor connected with the discharge from the ear) to those brought into close companionship with him, and finally, in a few instances, to death, through inflammation of the adjacent brain. Almost every reader of these pages will be able to recall to mind instances of the truth of this statement among his immediate circle of acquaintances. It would not be far from the truth to say that *nearly all* of these unfortunate individuals might have been spared such serious results, had the earache, with which the disease commenced, been intelligently treated at the very beginning.

Unfortunately, the day has not yet arrived when every physician is able to recognize a commencing inflammation of the middle ear, or, having recognized it, to make a cut through the drum membrane and so prevent the serious results already described. Until that day arrives, blame cannot justly be cast upon the general practitioner who fails to afford the desired relief. On the other hand, *it is more often the case* that the patients themselves or their friends are to blame; they send for the physician only after the major part of the damage has been done—for *hours* are precious in a matter of this kind. However clearly he may then recognize the nature of the disease, and however boldly he may resort to the use of the knife, his efforts will at most mitigate the otherwise serious results.

Treatment.—Earache depends upon a variety of conditions of the ear, and accordingly requires different methods of treatment if the desired relief is to be quickly obtained. As, however, these different conditions cannot be distinguished by a non-professional person, I shall simply mention those measures which tend to relieve pain and allay inflammation.

In the case of a strong, healthy adult, *leeches* afford the surest and speediest means of arresting inflammation and relieving pain. They should be applied *as close to the external orifice as possible*, and should be left undisturbed until they drop off of themselves. Then the bites may be sponged for a time, say fifteen or twenty minutes, with warm water, in order to promote further bleeding. After that, a small pad of cotton wool should be laid over the bites, then some hard object like a large cork (wrapped up in a piece of old linen), and finally a bandage. The object of the latter, which should pass over the head and beneath the jaw, is to keep the cork or other hard object firmly pressed against the leech-bites until the bleeding is arrested. As soon as this has been accomplished, both

the bandage and the cork can be removed. The number of leeches to be used must depend upon the severity of the pain and the vigor of the patient. Three, or at most four, usually suffice. In adults of rather feeble physique, it will be advisable to apply only two leeches. On the other hand, little more than annoyance and loss of valuable time need be expected from the application of only two leeches in a strong adult. *In children under fifteen or sixteen years of age leeches should never be employed except under the immediate supervision of a physician, or of some person skilled in such matters.*

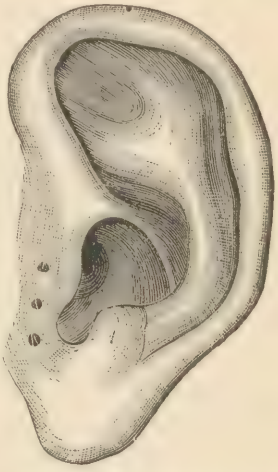

FIGURE 88.—The dots show where leeches should be applied to relieve earache and inflammation of deep parts of the ear.
(For mode of applying leeches, see chapter on NURSING.)

As much, if not all, of the good effect of local bleeding may be lost by not making the leeches bite at the proper place, it is a good plan to mark with a pen and ink the exact spots on the skin where the leeches are to be applied. The three dots in the accompanying figure show where, in the majority of cases, the leeches can be applied to the greatest advantage.

The next most potent means at our command for the relief of pain is *heat*. To bring heat to bear upon the ear, a number of contrivances can be employed. The ordinary flaxseed meal poultice, combining as it does moisture with heat, is perhaps the best known of all these contrivances. Poultices, however, are disagreeable things to have in contact with the head. A better plan is to fill a soft flannel bag (eight or ten inches square) with hops, steep it in hot vinegar and water (or simply in hot water), and then squeeze it as dry as possible. This makes a soft warm pillow and is usually very soothing to the suffering ear. Several thicknesses of flannel, soaked in hot water and then squeezed as dry as possible, furnish another excellent form of warm moist application for the relief of earache. So far as the relief of pain is concerned, the dry-hot applications are probably equally efficacious. A linen bag filled with bran and heated in the oven* will answer fully the required purpose. It will be found more convenient to prepare two

* With a little ingenuity one can easily adapt a wire frame to an ordinary kerosene lamp (or gas burner). Upon this frame a tin pie-plate should be placed at a distance of six or eight inches above the flame. A second plate inverted and placed on top of the first one, will then furnish an excellent oven in which the bran-bag can quickly be heated to the desired temperature.

such bags, as then, while one bag is in active use, the other may be heating in the oven. A heated flat-iron wrapped in flannel will also answer the same purpose.

The heart of a freshly roasted onion is very often laid upon the orifice of the ear for the relief of earache. I do not know that it possesses any special virtue not possessed by the other hot applications just mentioned.

Sometimes an earache is relieved by allowing a gentle stream of pretty warm water to enter and pass out of the ear during a period of several minutes. If a Fountain douche or Clarke's ear douche cannot be obtained, an ordinary tin funnel, with a rubber tube of suitable size attached, may be made to answer the same purpose.

If all these measures fail, and especially if the parts behind the ear begin to be tender on pressure, it may be taken for granted that the inflammation is extending, and that none of the ordinary home remedies can be trusted to arrest the progress of the disease. Under such circumstances professional assistance should be obtained without an hour's delay.

It is not a rare occurrence for persons to complain of earache when in reality the ear itself, in all its parts, is perfectly normal. In these cases the real seat of the difficulty is a decayed tooth, and the earache is simply "sympathetic," as it is technically called. Upon the removal of the offending tooth the earache disappears.

Next to earache, otorrhœa, or a

Discharge from the Ear,

Is the commonest symptom for which patients seek relief. If of recent date and immediately preceded by pain of at least several hours' duration, it may be attributed either to an abscess in the external auditory canal, or to an inflammation of the middle ear, with perforation of the drum membrane. If with the pain and the discharge there have been no decided deafness, and if there have been considerable tenderness on the outside of the ear, especially just in front of the external orifice, it may be confidently inferred that the discharge comes from an abscess in the external auditory canal.

If of long standing, the discharge very probably comes from the middle ear. If blood makes its appearance in the discharge, the inference is a fair one that granulations ("proud flesh") have formed either in the external auditory canal, or in the middle ear. In such an event it is very important that the ear should be examined by a physician who is familiar with diseases of the ear. The

presence of granulations or of polypi implies the existence of a condition of irritation sufficiently marked to demand active interference on the part of the physician. Polypi should be removed, as they may interfere with the escape of matter, and so favor an extension of the inflammation to the brain.

Treatment.—In cases of discharge from the ear, the point of greatest importance is to prevent the pus from stagnating in the external auditory canal, and thus becoming foul and very irritating to the parts which it bathes. Syringing the ear with lukewarm water is probably the simplest and at the same time the most effective method of accomplishing this object. If the discharge be scanty, it will probably be sufficient to syringe the ear but once a day; if it be abundant and smell badly, the syringe should be used as often as two or three times a day.

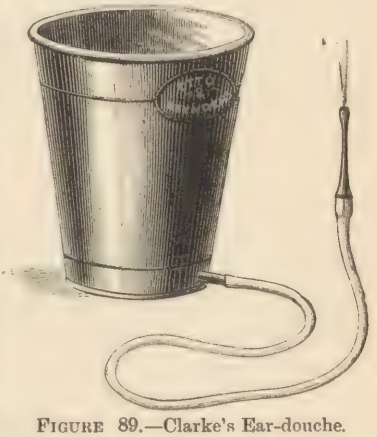

FIGURE 89.—Clarke's Ear-douche.

In cases of discharge from the ear, the Fountain douche or Clarke's douche will be found to answer the desired purpose even better than the syringe. Care should be taken, however, to use a nozzle sufficiently small, as most of those sold in the shops, to be used in connection with the douche are far too large to be inserted into the external orifice of the ear. Farther on I shall call attention to the precautions which one should observe in syringing out the ear.

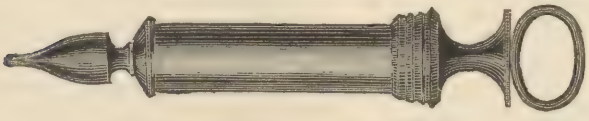

FIGURE 90.—Hard rubber ear-syringe.

I dare not suggest any remedies for arresting the discharge, simply because those solutions which in certain cases prove beneficial, in others only serve to aggravate the condition which causes the discharge. At the same time I must state, in very distinct terms, that the commonly received idea, that "*if a discharge from the ear be stopped, it will go to the brain*," is false, and should be rooted out of the public mind. To arrest the discharge without remedying the condition which gives rise to the discharge, would, indeed, be highly injurious; on the other hand, the arrest of the discharge by suitable treatment of the fundamental disease, is the best means of preventing that very disease of the brain, of which

people are so justly afraid in connection with a discharge from the ear.

Ringing in the Ears.

By this expression is meant not only ringing in the ears, in a strict sense of the term, but also all the different subjective sounds of which patients are wont to complain. It is a very annoying symptom, and its source is sometimes found in an accumulation of wax in the external auditory canal, in the presence of an insect upon the outer surface of the drum membrane, or in the existence of an inflammatory condition of the middle ear or neighboring parts; more often, however, no demonstrable cause can be found, and one is driven to assume that some unnatural condition of the nerve of hearing exists. In the majority of cases of long standing, all efforts to relieve this annoying symptom prove unavailing. On the other hand, the ringing oftentimes disappears of itself, without our being able to assign any valid reason for its disappearance.

Foreign Bodies.

Foreign bodies and insects frequently find a lodgment in the ear. Unless they are of such a size and shape as to injure the walls of the external auditory canal, their presence need give no special anxiety. Clumsy and incautious efforts with forceps and other instruments often convert a harmless state of things into one fraught with suffering and some danger to life and hearing.

Treatment.—Syringing with lukewarm water is the only means which a non-professional person can safely employ for the removal of the foreign body or insect. If the insect can be felt moving about in the ear, it may be well to drop a few drops of glycerine into the passage-way before resorting to the syringe. Sweet oil may be used instead of glycerine; but in that event soap must be added to the lukewarm water used afterwards in syringing, as the presence of oil in the external auditory canal sometimes gives rise to a very rebellious and annoying inflammation of these parts. The practice of dropping sweet oil into the ear for the relief of the most varying conditions is almost universal; it being generally believed that no possible harm can come from such a practice. As the unpleasant results just mentioned are not so very rare, it would be safer to make the rule never to use sweet oil in any ear trouble.

If one is confident that the external auditory canal is blocked up by the presence of a mass of *hardened wax*—*e.g.*, if it can be seen or felt—syringing with lukewarm water may be resorted to

for its removal. If, after reasonably prolonged efforts, the mass still remains impacted in the canal, bicarbonate of soda can then be employed to soften the mass. The patient should lie upon a sofa or bed with the affected ear turned upward. Into the passageway are to be dropped first a pinch of the soda, and then a few drops of tepid water for the purpose of dissolving it. This concentrated solution of soda should remain undisturbed in the auditory canal about half an hour. The syringing is then to be repeated, and if it still fail to dislodge the mass of wax, a second or even a third soaking with the soda solution may safely be resorted to. If all these efforts fail, professional assistance will have to be obtained.

Syringing the Ear.

So many people fail in their efforts to use a syringe successfully, that a few simple directions will perhaps prove of value.

In the first place, almost all glass or lead syringes, or such as have to be managed by both hands, are likely to cause pain to the patient and to fail of accomplishing the desired purpose. The so-called Davidson's syringe is a decidedly better instrument for ear purposes. The person who uses it, however, is very apt to throw into the ear a stream of too great force. The best instrument is probably the hard rubber ear syringe (the smaller of the two sizes usually sold), which is constructed in such a manner that it can readily be managed with one hand. (See Fig. 91.)

FIGURE 91.—Manner of syringing the ear.

In the next place, it is a very common error for people to hold the nozzle of the syringe *near* the outer orifice of the ear instead of introducing it *into* the passage. In syringing the ear, the operator should lift the patient's auricle upward and a little backward with the thumb and forefinger of his left hand, for the purpose of making the external auditory canal as straight as possible.

He should then introduce the short nozzle of the syringe (see the figure) as far into the ear as he can without actually blocking up the entire orifice.* If he holds the syringe in the right direction, the patient will experience no discomfort from the presence of the instrument in the canal. On the other hand, if he points it too far forward or backward, or in any wrong direction, the patient will be pretty sure to give him due notice of his error. In very young children the auricle must be pulled backward and perhaps a little downward, and the nozzle must be introduced only a very short distance into the canal. Finally, the water must neither be too hot nor too cold,—that is, from 85° to 90° Fahrenheit,—and care must be taken not to use too great force.

Care of the Ears.

The discussion of the question of syringing the ear suggests very naturally another question—how can the healthy ear be safely and effectively cleansed? In answer to this question, I would say that, under ordinary conditions, only that portion of the ear which is easily visible requires cleansing. To accomplish this, the end of a soft towel, a bit of sponge, some cotton-wool wrapped closely round the end of a wooden match, or any other similar contrivance, may be safely used. So long as the person, whose ear is thus being cleansed, makes no complaint of pain, it may be taken for granted that no harm is being done.

Still another question is often asked—ought cotton-wool or lamb's wool to be worn in the ears? In reply to this, I would say that the patient's own feelings should be our guide in this matter. The undue warmth produced by the presence of a mass of wool in the external auditory canal rather tends to promote a congested condition of the parts. Hence, unless the patient feels more comfortable with the wool, or unless the abundance of the discharge from the ear renders its use necessary for purposes of concealment, I should advise leaving the ear exposed, as Nature evidently intended it to be.

General Remarks.

Before closing this brief chapter, I may profitably add a few cautions regarding the avoidance of diseases of the ear.

1. *Measles* and *scarlet fever* are exceedingly liable to be fol-

* If some other form of syringe than that referred to here (and represented in Fig. 90) be used, the nozzle must not be introduced farther than a quarter of an inch beyond the orifice of the canal.

lowed by severe inflammation of one or both ears. Hence the great importance of prompt interference to prevent the serious consequences which might otherwise follow. If parents would bear this fact in mind and give the attending physician timely notice of the approach of trouble in their children's ears, the number of cases of life-long discharge from the ear might be materially diminished.

2. The operation of *puncturing the drum membrane* is not only a perfectly safe operation, but is generally considered by aurists as the surest means the physician possesses of relieving pain in the ear, and of preventing those profound disturbances of nutrition (ulceration, death of the bone, etc.) which cause marked deafness and chronic discharge from the ear. For the sake of emphasis I might add, that the popular idea that if a drum membrane be cut, the opening will never heal up and the hearing will be destroyed, has no foundation whatever in fact.

3. *Laudanum* and *spirits of camphor*, remedies which are very commonly prescribed for the relief of an earache,—should never be introduced into the ear.

4. The habit of vigorously *scraping the external auditory canal* with an "ear-spoon," not unfrequently leads to the formation of an abscess, and should be avoided.

5. The practice of *snuffing up cold water* (and sometimes even warm water) into the nostrils, is now and then followed by acute inflammation of the middle ear; some of the water finding its way through the Eustachian tube into the middle ear. The nasal douche, unless used with great caution and in accordance with certain prescribed rules, is also very apt to give rise to painful affections of the middle ear.

6.—Bathing in salt (and sometimes also in fresh) water is quite often followed by earache and deafness, and occasionally by very serious inflammation of the ear. There is a popular idea that the disturbance is produced by the entrance of the water into the external auditory canal, and such indeed is beyond all question, in certain cases, the fact. In the majority of instances, however, the inflammation is caused by the entrance of the water first into the nostrils, and thence through the Eustachian tube into the middle ear or drum cavity. As a rule, therefore, it will be found unavailing to stuff the external orifices of the ears with cotton before entering the water. It is more important to avoid that vigorous "nose-blowing" which everybody is tempted to indulge in upon coming out of the water; for it is by this act, more than by anything else, that the water is likely to be driven from the nostrils up into the Eustachian tubes and drum cavities.

7. *Boiler-makers*, and those exposed for hours at a time to loud noises of any kind (especially such as are accompanied by a strong concussion of the air), should remember that they run a great risk of losing their hearing—not suddenly, but slowly and steadily. *Telegraph operators* are also exposed to the same danger, though to a slighter degree.

8. Persons who take *quinine* in large doses for any length of time should be on their guard, as this remedy in a few cases seems to be capable of inducing decided deafness. The danger commences when the ears begin to ring. The development of this ringing or buzzing in the ears should therefore serve as a warning that the quinine is either to be stopped altogether for a time, or else is to be taken in diminished doses.

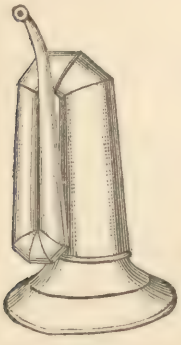

FIG. 92.

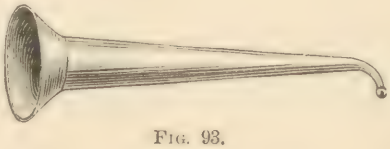

FIG. 93.

FIG. 94.

FIGURES 92 and 93.—Varieties of ear-trumpets.
FIGURE 94.—A conversation-tube.

9. Persons who are very deaf, will often find it possible by means of an ear-trumpet or a "conversation-tube," to hear ordinary conversation, or public speaking, with more or less ease. It is exceedingly rare, however, that the use of the "false drum membranes" proves of any material assistance to the deaf person.

ALBERT H. BUCK, M.D.

DEAF-MUTISM.

BY

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DEAF-MUTISM.

THE term deaf-mute is commonly applied to those whose sense of hearing is, from any cause, either entirely lacking or so defective that they are unable readily to communicate with their fellow-men by speech. In ninety-nine cases out of a hundred, deafness is the only defect, and the person is mute only because his inability to hear has rendered him so, and not on account of any deficiency in the vocal organs. Hence the word *mute* is preferred to *dumb*, the latter seeming to carry with it the idea of some physical defect.

Deaf-mutes are naturally divided into two classes, technically called mutes and semi-mutes. By the former are understood those who either were born deaf, or lost their hearing before they had begun to acquire the power of speech. By the latter are meant those who did not lose their hearing till they had learned to talk, and thus make words the vehicle of their ideas.

A very little reflection will show that the man who has become familiar with his mother-tongue has a great advantage over him who has, so to speak, had no mother-tongue, but has been compelled to acquire, slowly and painfully, not only the vocabulary he would use, but also the ability so to unite words as to convey accurately and idiomatically his ideas either to himself or to others. Certain results follow this division into two classes, especially affecting modes of instruction, which will appear farther on.

Statistics.—Few things are more vexatious, nor often more mischievous, than unreliable statistics. The old adage that "figures cannot lie," is continually disproved by the contradictory results which the same sets of statistics are made to afford under the hands of skilled manipulators. The so-called statistics of deaf-mutism are not free from either of these causes of error, and yet each attempt, however imperfect, renders greater accuracy for the future possible.

It was estimated by M. Guyot, in 1842, that the total number of

deaf-mutes in the world was 600,000. The latest estimate of the probable population of the globe places it at about fourteen hundred millions. The generally accepted proportion of 1 to every 1,500 would give 933,000 as the total number of these children of silence upon the globe. But we are not without more accurate data. The following table is taken from an article by Rev. H. W. Syle, in Appleton's Encyclopædia, Revised Edition :

Countries.	Date.	Proportion of one in
Switzerland, Aargau	1836	189
" Vaud	1836	1,112
Sardinia	1834	769
Norway	1835	977
Sweden	1840	1,528
Denmark	1834	1,942
Holland	1833	2,000
Belgium	1835	2,226
Luxembourg	1835	2,295
Prussia	1849	1,364
France	1853	1,212
Ireland	1861	1,176
Scotland	1861	1,311
England	1871	1,971
United States	1870	2,380

The total number reported in the United States in the census of 1870 was 16,205, but subsequent investigations, made in limited regions, seem to indicate that this number is too low, and that from 20,000 to 25,000 would be a more accurate estimate. The latest and fullest statistics give the ratio in England and the United States as not far from 1 to 2,000 ; in Europe about 1 to 1,500. Respecting the other continents we know very little.

Causes.—These naturally divide themselves into ante-natal and post-natal. The former largely predominate in older countries where deafness is only one of many indications of race-deterioration, often associated with idiocy, feeble sight, goitre, cretinism, and other evidences of mental and physical decay. The latter are decidedly in excess in America, where the process of race-deterioration has hardly begun. These facts appear from the following table :

	Total.	Congenital.	Adventitious.	Unknown.
Great Britain	4,200	3,288	912	
United States and British Provinces	3,784	1,401	1,983	400

Under the first head heredity and consanguineous marriages

are placed as the two chief causes. The first of these, however, is probably less influential than is generally supposed. Dr. H. P. Peet, of New York, makes the computation that the probability of deafness among the children of parents deaf from accidental causes is only 1 to 1,600; where one parent is congenitally deaf, 1 to 130; where both parents are congenitally deaf, 1 to 10.

The statistics of five American institutions for 1878 are as follows:

	Children deaf-mute.
Both parents deaf-mute	35
One parent "	20
Neither parent "	2,501
Whole number	2,556

All conclusions, however, drawn from such tables, need to be re-adjusted upon the basis of the ratio of deaf-mute families to the whole community.

Dr. W. W. Turner, in a paper on this subject, shows that in 24 families in which both parents were congenital deaf-mutes there were 57 children, of whom 17, or nearly one-third, were deaf-mutes; and that in 86 families in which one parent was a congenital deaf-mute there were 218 children, of whom 21, or about one-tenth, were deaf-mutes. Lacking in agreement as these different statistics are, they all seem to indicate the inadvisability of the inter-marriage of deaf-mutes.

As to the question of consanguineous marriages as a cause of deaf-mutism, the assertion that "figures cannot lie," is entirely disproved by the radically different conclusions which have been demonstrated (at least to their own satisfaction) by different investigators. The reports of three institutions in the United States and one at Halifax give statistics as follows:

	Families.	Deaf-mutes.
Parents first-cousins	30	64
" second cousins	11	24
" second and third cousins	1	2
Distantly related	17	33
Not related	252	267

"Twenty-five out of these thirty families, containing 53 out of the sixty-four deaf-mutes whose parents were first cousins, are mentioned in the catalogue of the Halifax Institution, the total

number of whose pupils has been only 224. This striking excess in the relationship of parents among the pupils of this institution over those of the other institutions from which we have statistics is doubtless due to the fact that the marriage of near kin has prevailed to a far greater extent in the British maritime provinces than in the United States." Dr. Bemiss, of Louisville, Ky., on investigating 833 consanguineous marriages, found that of the 3,942 offspring, 1,134 were defective, of whom 145 were deaf and dumb, and estimated that ten per cent. of the deaf in the United States sprang from kindred parents.

The prevalence of deafness as well as of idiocy, cretinism, and goitre, in mountainous districts (the deaf amounting at one time to one per cent. of the total population in part of the Canton de Vaud, Switzerland), must be partly due to the intermarriages in a secluded and stationary population; and the less proportion of congenital to accidental cases in the United States than in Europe to the free intermixture of races here. By others the validity of these conclusions is strenuously denied, and it is claimed that a more extended and exhaustive induction of facts disproves the theory. All this clearly demonstrates the necessity for more careful collation of reliable statistics. It would, however, seem self-evident, whatever might be the result of consanguineous marriages in the case of those physically and mentally sound, that where any abnormal weakness or liability to disease is a marked family characteristic, intermarriages, even between distant branches of such a family, would have a strong tendency to develop such weakness, each generation exhibiting it in intensified form.

*"It has been noticed in Europe that deaf-mutism is more infrequent in flat than in mountainous countries, probably only because cretinism is more common in the latter. Deaf-mutism is more frequently met with in the country than in cities. The affection is more common in males than in females. In Bavaria the excess is eighteen per cent. In educational institutions the excess is much larger, forty-nine institutions in the United States containing 3,568 males and 2,598 females. It is a remarkable fact that this defect is incomparably more frequent among Israelites than among Christians. In the Department of Cologne, in 1849, the proportion was 1 to 1,814 Catholics, 1 to 2,638 Protestants, and 1 to 560 Jews." Consanguineous marriages seem to offer the most plausible explanation of this fact. "This infirmity is met with far

* Kussmaul, in Ziemssen's Cyclopædia, American ed., Vol. XIV.

more frequently in the poorer classes." Alcoholism, on the part of parents, is also noticed as a cause of deaf-mutism in children.

As regards post-natal causes, the American Annals for the Deaf and Dumb, for 1878, gives the latest and most reliable classification.

Nine institutions give statistics as follows:

	Number.	Ratio.
Congenital	1,737	.40
Scarlet fever	581	.135
Cerebro-spinal meningitis	256	.06
Brain fever	194	.045
"Sores in head" *	187	.04
Measles	111	025
Accidents	91	.02
Typhoid fever	77	.018
Whooping-cough	67	.016
Colds	66	.016
Fits	41	.01
Hydrocephalus	35	.008
Scrofula	27	.006
Pneumonia	22	.005
Diphtheria	18	.004
All others	828	.192
Whole number	4,338	

"All others" include some forty different causes; among them "quinine" and "calomel," and are often to be taken "*cum grano salis.*"

Cure.—Upon this point very little is to be said. Medicine and surgery alike have been compelled to acknowledge their inability to accomplish for the ear any of the triumphs which they have so often achieved in behalf of the eye. Especially in early days, many an unfortunate deaf-mute "suffered many things of many physicians, and was nothing bettered, but rather grew worse," and too often has suffered cruel tortures, and sometimes death itself, at the hands of ignorant pretenders. Seldom will a reputable physician hold out to a deaf-mute any hope of substantial improvement. Of all others the deaf-mute should especially beware.

But while little can be done in the way of cure, something may be done in the way of prevention, and it is gratifying that in Great Britain the statistics of three decades show a decided gain: the proportion in 1851 being 1 to 1,590; in 1861, 1 to 1,432; in 1871, 1 to 1,644. Upon this fact an English writer, Dr. David Buxton, thus comments: "If we may regard it as the consequence of direct

[* Probably diseases of the ears, many of which cases may also be counted as the results of scarlet fever.—ED.]

sanitary improvements, general attention to the laws of health, a more skilful treatment of the diseases which result in deafness, and the avoidance of consanguineous and other undesirable marriages, we have certainly gained a great blessing, and made a grand discovery for posterity to profit by. Guided by the light thus given, we may hope to see the number of this afflicted class brought down to the point at which it may be considered due to causes which are beyond man's control."

Education.—While very little has been accomplished in the way of cure, for no class has education accomplished more than for deaf-mutes. For centuries this class of human beings was neglected and shut out from the pale of common humanity, not only by the thoughtlessness of the ignorant and the cruelty of the unfeeling, but by the common consent even of philosophers, statesmen, and philanthropists.

Aristotle denied that mutes possess intellect. The Justinian Code declared them incapable of civil acts. St. Augustine asserted that "deafness from birth makes faith impossible, since 'faith cometh by hearing,' and he who is born deaf can neither hear the word nor learn to read it." Such was the status of the deaf-mute —unable to enter a protest in his own name—without an advocate to plead in his behalf. The state did not regard him as entitled to the rights of citizenship ; even the church considered him as unworthy to enter within her pale. Within the last century all this has changed. First, the Christian philanthropist, then the statesman has discovered that the deaf-mute has capabilities, and therefore rights and duties ; and that, for the enjoyment of the one, and the performance of the other, the necessary preparation should be supplied both by church and state. It has been found that the deaf-mute is not a poor imbecile ; is not even necessarily inferior in any respect in mental capacity to his hearing and speaking brother. He does labor under the disability of having one avenue whereby impressions are received from the outer world closed ; and hence the instruction ordinarily given, and the education ordinarily gained through the ear, must be supplied in some other way. Hence what he needs is just what every child requires : not protection, but education ; not the asylum, but the school, the academy, the workshop, the college. Only a means must be devised by which he can come into easy, rapid, exact communication with both books and teachers.

In every civilized nation such provision is now made. Especially has this been done in our own country, where universal suffrage renders universal education an imperative necessity. Now every State in the Union, except Florida, makes annual appropri-

ation for the education of deaf-mutes, as having the same claim to the advantages of "free schools" as any other class of citizens. Nor should these institutions any longer be regarded as "asylums," nor their pupils as "patients" or "inmates," but as simply one department of our common-school system; the very object of which is, by providing for the deaf-mute that special instruction which he requires, to prevent his needing any asylum, and to send him out into the world as a man able to do good, honest, useful work, and asking of society only that work and its well-earned wages, "a fair field and no favor." But it must ever be borne in mind that this change in popular feeling and judgment respecting the status of the deaf-mute is conditioned solely on his being educated. No amount of sentiment or philanthropy can make aught of him without education. Lacking this he is still, in the eye of the law, *non compos*, neither legally nor morally responsible for crime, though, of course, liable to restraint. Yet, further, he is regarded as actually ignorant of the principles of right and wrong, of general law, either human or divine, and of all sanctions, save in some few specific cases. Mentally, his condition is thus graphically stated by President Gallaudet, of the National Deaf-Mute College:

"Having no language in common with his fellow-men; shut out from the stores of information and food for thought, conserved in books; unable to acquaint himself with even the news of the day as chronicled in the journals; often excited, and perhaps tormented with thoughts and queries for which he has no means of exact expression; his mind may be likened to an eagle caged, or a lion chained. He will either lapse into the contentedness of ignoble bondage, or drag out an unhappy existence, beating at bars, or chafing in fetters, from the thraldom of which he is powerless to free himself."

So soon as the power of education to deliver the deaf-mute from this condition is recognized, and the possibility of his education demonstrated, it is not strange that popular interest is awakened in the subject, and that appeals in his behalf meet a ready response. But for centuries no such possibility was even dreamed of, and a few instances scattered along the pages of history seemed rather like fairy tales than veritable narrative.

History of Deaf-Mute Education.

Pliny mentions that Quintus Pedius, a relative of Augustus, although a mute from birth, being instructed in painting on the recommendation of the orator Messala, made great proficiency in that art.

The venerable Bede, in the seventh century, gives an account of St. John, of Beverly, Bishop of Hagulstadt, who, calling to him a dumb youth on whom he was accustomed to bestow alms, and making the sign of the cross on his tongue, commanded him to repeat the Anglo-Saxon word, *gea*, yea, which he did, and afterwards repeated from the bishop's lips, first letters, then syllables, and so on to words and sentences. Add the factor of time, the miraculous element disappears, and we see in the good bishop only the forerunner of the modern teacher of articulation. The next mention of any such case is by Rudolph Agricola (died 1485), who records that a certain deaf-mute had learned to write. Platenus states that at Basle, in 1530, was a deaf man, who could not only write, but could understand the preaching of the reformer Œcolampadius from the motions of his lips.

The first philosophical recognition of the possibility of deaf-mute instruction was made by Jerome Cardan, of Pavia (died 1576). "The instruction of the deaf and dumb," says he, "is difficult, but it is possible. Writing is associated with speech, and speech with thought; but written characters and ideas may be connected with each other without the intervention of sounds."

The first attempt to put this theory in practice on an extended scale, and with such success as to compel the notice of contemporaries, was by Pedro Ponce de Leon, a Benedictine monk (1520–1584). In 1620 Juan Pablo Bonet, a native of Arragon, published the first treatise on the art; *The Reduction of Letters, and Art of Teaching the Dumb to Speak.* He employed the manual alphabet, gestures, and articulation. In England, during this century, several books were written upon the subject, and Dr. John Wallis achieved great success as a teacher. In Holland, John Conrad Amman published a work in 1692, *Surdus Loquens*, which is still a valuable treatise on the method of teaching articulation. But it was not until a century later that the two men who have given names to their respective systems, and whose work has known no interruption, commenced their work, Heinicke, in Germany, in 1758, and the Abbé De l'Epée, in France, about 1760. At about the same time with the latter, Braidwood commenced his work in England; but its exclusiveness, and his exorbitant charges for instruction in the art greatly hindered his usefulness, and prevented the rapid extension of his methods even in England. Hence the two so-called rival systems have taken the names of the German and the French methods respectively; or, as they have been sometimes styled, the artificial and the natural; the one relying mainly on articulation and lip-reading as the means of communication between teacher and pupil; the other making

special use of the sign language and the manual alphabet; both seeking as soon as possible to make the printed page accessible to their pupils. By both it is acknowledged that the easy and idiomatic use of the vernacular is the prime object of endeavor, as the means of acquiring both facts and facility in mental operations.

It is claimed by the extreme advocates of the German system that any use of the sign-language, or even of the manual alphabet, tends to divert the mind of the pupil from his special object of acquiring the power of speech; offering to him an easier method, indeed, of expressing his thoughts, but one which will by its very ease of expression, release him from that unremitting application which here, as elsewhere, is the price of distinguished success.

On the other hand, the followers of De l'Epée claim that for a very large percentage of deaf-mutes the acquisition of articulation and lip-reading to any practical degree is an utter impossibility, while even the very small number who can attain any degree of success must for that sacrifice time which might have been better bestowed in the acquisition of knowledge and mental discipline, with the aid of the sign language, supplemented by the manual alphabet, when absolute verbal accuracy is required. Here, as elsewhere, the motto, "*In medio tutissimus ibis*" holds good, and what is known as the "combined system," in which both methods are employed, is growing in favor.

A brief description of the two methods may serve to make prominent the points of difference.

Under the French method, a pupil enters school at the age of, perhaps, seven years, knowing nothing except a few natural signs, which he has employed at home, expressing mainly physical wants. He goes into the school-room, is shown the picture of a cat, for instance, then the word is written upon the black-board, and he is made to understand that the word and the picture both stand for the same object. When this idea is thoroughly grasped, the same word is spelled upon the fingers, and this is shown to be a third method of representing the same thing. Lastly, the conventional sign for cat is made, indicating the whiskers, and the fact impressed upon the pupil's mind that these four are only different symbols for one and the same thing. Thus, step by step, a vocabulary is acquired. When a sufficient number of nouns has been mastered, the verb is taken up in the same way, and the idea of action communicated by the aid of these four-fold symbols. Then these are combined in sentences, and the subsequent progress is very much like that of any child learning to talk; the wonder at the ability of the deaf-mute thus to begin with single

words and pass on to sentences—to commence with the concrete and ascend to the abstract—being perhaps no greater than that which a little reflection would excite, as to the process by which an infant, absolutely destitute of language, and almost of ideas, comes to the mastery of his mother tongue. Only as this process is going on continually before our eyes, we cease to think of it as wonderful.

It would seem natural that the process should be much more rapid in the case of the hearing and speaking child, for whom almost every waking moment involves communication with parents, brothers and sisters, friends, and also constant over-hearing of the conversation of others. But, as a matter of fact, it is not uncommon that a deaf-mute pupil, entering school in September, is capable, the next April, of writing upon the black-board short sentences with considerable facility.

As regards mental progress beyond the acquisition of the ability to make known wants, and to express simple ideas, it is unquestionably true that the excessive use of signs does tend to interfere with the idiomatic use of the vernacular, to render reading laborious and therefore unattractive, and thus to retard the fullest development of the mental powers. But against this danger the wise and experienced teacher is ever on his guard, insisting upon dactylology (the use of the fingers) and the use of the black-board as correctives, while it is also true that deaf-mutism has no monopoly of such tendencies on the part of pupils.

The sign-language was, in its inception, the adoption by the Abbé De l'Epée of natural gestures, observed by him in the intercourse with each other of two young deaf-mute sisters, and is, in so far, closely related to the sign-language in common use among our North American Indians. It has been, by the Abbé Sicard and others, supplemented and enlarged, by the addition of many conventional signs and inflections, so that at present there is little difficulty in translating to an audience of intelligent deaf-mutes, an address delivered orally, upon any subject, and with nearly the rapidity of a good speaker. It admits of all shades of expression and varieties of style, compact or diffuse, severe or florid, and in the hands of a master becomes vivid and graphic pantomime. In fact, it lays claim to being the nearest approach to a universal language that the world has ever seen, enabling its possessor to carry on conversation with an educated deaf-mute in any country in Europe, and with many tribes of savages.

The manual alphabet is of great antiquity. It is possible that something of the sort is intended, when Solomon, in Proverbs vi. 13, alludes to those who "speak with the feet and teach with the

fingers." Bede tells us of manual alphabets founded on numbers even in his day, and there have been many others, facial, brachial, and pedal, as well as manual. The two which have come into general use in schools are known respectively as the double-handed and single-handed alphabets, the former used principally in England, and the latter more generally in France and the United States. Both are formed mainly by attempts to imitate with the fingers the outlines of the Roman letters. The latter, however, is the easier and simpler, and allows the use of either hand singly.

The German method relies almost exclusively on articulation and lip-reading; using a few natural signs only so far as may be necessary to establish communication between teacher and pupils, and in some institutions having recourse to writing in the air in place of the manual alphabet. In this method of instruction the teacher takes his (or her) place opposite the pupil, calling attention to the position of his (the teacher's) mouth and throat, and then seeks first of all to make him perceive the difference between a current of air issuing noiselessly from the throat, as in ordinary breathing, and the same vocalized; that is, made to pass between the vocal cords in such manner as to throw them into vibration. This can be made apparent to the eye, and still more so to the touch when the fingers are placed upon the throat.

When this idea is once communicated to the pupil, and the ability acquired to vocalize a current of air, the foundation is laid. All other sounds are with greater or less ease, in longer or shorter time, developed from this initial sound. He is taught so to modify the position of the vocal organs as to give the different vowel sounds by continuous vocalization, and then by suddenly interrupting the current of air, to produce the different consonantal effects; as in labials, linguals, palatals, and compounds. This process must be largely imitative and tentative in the first case for each sound, and a matter of memory at each succeeding repetition, so that the average hearing and speaking person, attempting to analyze his own processes of vocalization, even with the help of the ear, would be inclined to pronounce it an impossibility for the deaf-mute. But, like many other apparent impossibilities, it has been accomplished in multitudes of cases. Resort is frequently had to manipulation in the early stages of instruction, an instrument like an ivory paper-folder being used to depress or elevate the tongue and other organs. A hand-mirror is also found to be a valuable auxiliary.

Much study has been bestowed upon the phonetic elements of language, and many attempts made to illustrate, by diagrams, the position of the vocal organs in uttering the different sounds.

THE MECHANISM OF SPEECH
AS ILLUSTRATED IN THE
SOUNDS OF THE FRENCH LANGUAGE.

Designed by M. Leon Vaïsse,
Director of the Imperial Institution for Deaf Mutes,
Paris.

CONSONANTS.			VOWELS.	
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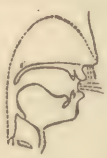
K	GU	GN	O	
F	V		Ô	 ON
S	Z		OU	

CONSONANTS.			VOWELS.	
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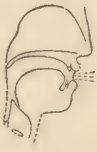
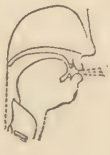
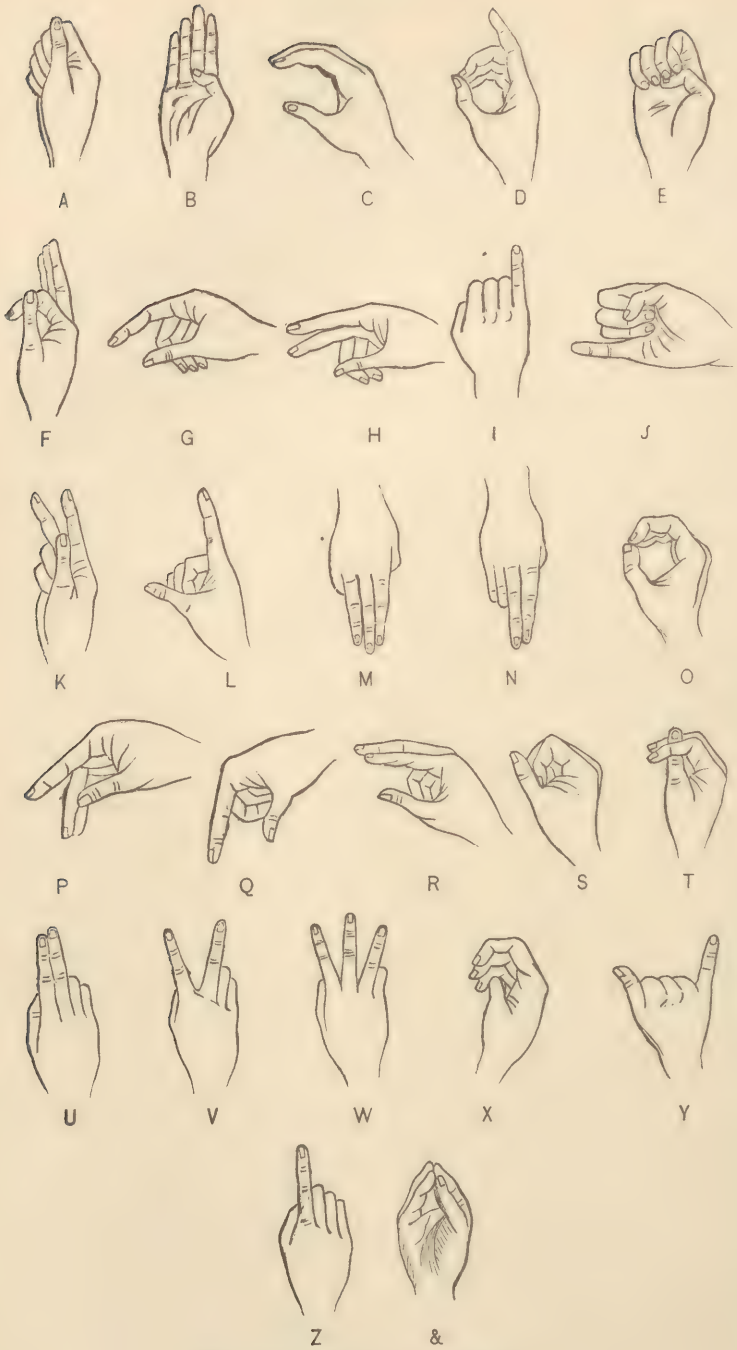
	L		 EU	UN
	R		 U	



The manual alphabet (single-handed).

ILLUSTRATIONS OF VISIBLE SPEECH.

Fig. 1

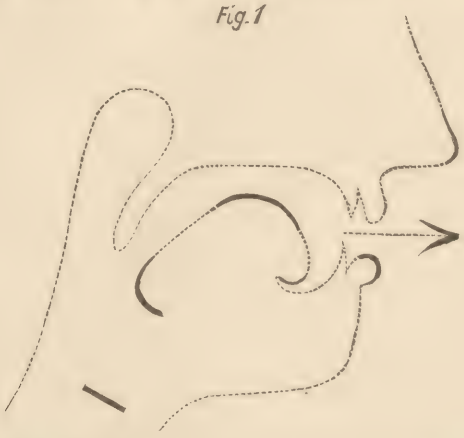


Fig. 2.

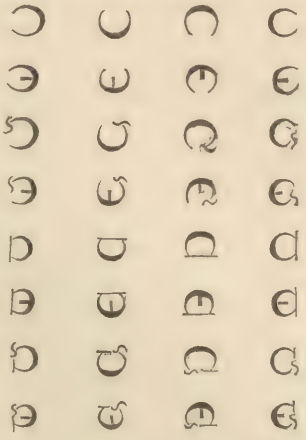


Fig. 3.

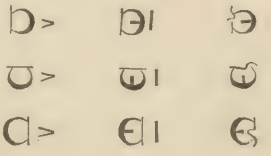
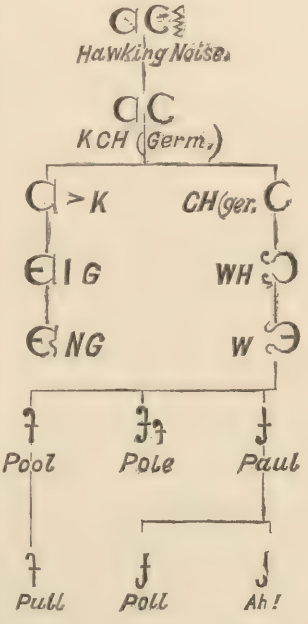


Fig. 4.



* For description, see page 344.

Helmont, in 1657, published his "*Alphabeti vere Naturalis Delineatio*," in which the different positions for the pronunciation of the Hebrew characters are beautifully represented. In 1668 Bishop Wilkins, the founder of the Royal Society, published his "Essay toward a Real Character, and a Philosophical Language," in which are both symbols of sounds, and also plates of the positions of the vocal organs in uttering the usual English vowels and consonants. Following these, Professor Léon Vaïsse, of Paris, has prepared a chart of the sounds of the French language, shown on pages 1034 and 1035.

But perhaps the greatest help to the instructor in articulation is derived from the system of "Visible Speech" symbols as invented by Prof. A. M. Bell, of England, and developed and specially adapted to deaf-mute instruction, by his son, Prof. A. G. Bell, now of this country, so well known in connection with the telephone. In this system the symbols are no longer purely arbitrary, but by their shape and direction indicate at sight the vocal organs to be called into play, and likewise the position they are to assume. Under this system the acquisition of speech becomes a sort of vocal gymnastics, in which the organs are trained to take every possible, or at least, needful position for the utterance of the sounds of every language.

It is claimed that any sound possible to be produced by the vocal organs, even a whistle or a groan, can be so represented by these symbols, that any adept, whether deaf-mute or otherwise, can, without ever having heard the sound, produce it with absolute accuracy, even accent and force being preserved.

It is likewise an excellence of this system, that when the deaf-mute pupil trying to produce a certain sound, fails in that, and makes another, he can be shown by the symbols the sound he has made, as well as that he has failed to make. The pupil is thus conducted along the avenue of vocalization till its most shaded paths and rocky passes are all familiar and easy, and then he is suddenly ushered into what he is told is the royal city of speech, his tiresome journey accomplished, and henceforth only the pleasant task of familiarizing himself with the places and the people he meets. This system of symbols is given on the foregoing pages.

Lip-reading, always more or less closely associated with articulation in courses of instruction, seems to be very largely a matter of natural endowment rather than of acquired ability, though, of course, practice is essential to any high development of the ability. But not a few deaf-mutes, without instruction or special opportunity for accurate practice, will understand much of what is said in their presence, while many others, of marked mental ability, not

only have no such natural gift, but find it almost impossible to acquire it.

Both lip-reading and articulation in the case of semi-mutes can be preserved or developed to a very considerable extent in the family, where affection, patience, and tact are united in the effort. As to the success actually attained by the two systems, the advocates of each make claims hardly acknowledged by the other.

While in this country the great preponderance of authority is in favor of the French system as the basis of general instruction, yet what is known as the combined system is now authoritatively endorsed by the convention of principals of deaf-mute institutions, in which instruction in articulation is given to semi-mutes, and to such others as are found upon trial to possess natural aptitude for the acquisition of speech; while, on the other hand, a limited use of natural signs and of the manual alphabet is allowed in many articulation schools.

The main difference of opinion to-day would probably be as to the proportion of deaf-mutes in our institutions who can be benefited or better instructed and fitted for useful and happy lives by the articulation system. Even on this point there is a much nearer agreement between those actually engaged in the work of teaching by the two systems respectively, than between the theorists and writers whose sympathies are warmly interested on the one side or the other, and whose confidence of assertion is often in inverse ratio to their actual knowledge of the practical working of the two systems.

The late Moritz Hill, of Weissenfels, perhaps the best authority on the German side, says: "Out of one hundred pupils eighty-five are capable, when leaving the school, of conversing on commonplace subjects, with their teachers, family, and intimate friends. Sixty-two can do so easily. Out of one hundred, eleven can converse readily with strangers on ordinary subjects. Many others learn to do this after leaving school."

Prof. Vaïsse says: "In my opinion, nine out of ten can learn spoken language so as to derive more or less benefit from it; but only five or six will speak with sufficient ease to converse readily on all common subjects with their family and friends.

"As to their intercourse with their teachers, it extends to a much larger number, to seven or eight out of ten. With strangers, intercourse is much more limited. On some common topics, to be sure, it may extend to those seven or eight out of the ten I first mentioned, but on *all* subjects and with *ease* it will not extend to more than two, and often no more than one out of these same ten pupils."

Dr. Gallaudet, in his report on Systems of Deaf-Mute Instruction in Europe, gives the case of a young man congenitally deaf, whom he met in Holland, and with whom he conversed in German for a half hour, first in a parlor, then walking along crowded streets, and then riding over pavements in a carriage, the conversation being carried on with perfect ease, and without any resort to signs. But such cases are exceptional, both as regards natural capacity and educational advantages.

The problem, as it presents itself in this country, is How can the average deaf-mute, with a given expenditure of time and money, both limited, be best fitted for usefulness and happiness in the world? The great majority of instructors in the United States would answer, "By the use of the sign language and the manual alphabet, with instruction in articulation and lip-reading for all who are found upon trial to be capable of profiting by it." For, unless instruction in the artificial system can fit the deaf-mute for *easy* intercourse with the outside world, it hardly seems to promise enough to compensate for the great expenditure of time and labor. The sign language gives him rapid and easy intercourse with his teachers, with his family and friends. Dactylology, and a limited use of signs, furnishes ready means of communication; and with the outside world writing is always exact, if not rapid.

As to what are technically known as "deaf-mutisms," or those mistakes in numbers, tenses, and idioms, such as are often made by foreigners in the use of English, it is a somewhat curious and interesting, as well as unexpected fact, that they are found as frequently in the compositions of those instructed by articulation alone, as of those who have been taught by signs.

Institutions.—These are found as follows—though many of these statistics are out of date:

United States	49
Canada	6
Great Britain and Ireland	29
France	61
Belgium and Holland	10
Denmark, Sweden, and Norway	23
Russia	3
Prussia	49
Other German States	50
Switzerland	11
Italy	15
Spain	2
Portugal	1
Australia	1
Brazil	1
Total	311

It is estimated that these comprise more than 1,500 teachers, more than 15,000 pupils, and involve an annual expenditure of between four and five millions of dollars.

The history of deaf-mute education in the United States is inseparably connected with the name of Rev. T. H. Gallaudet, who, in the year 1815, went to Europe to investigate the different systems of deaf-mute instruction. Deciding in favor of the French method, he became a pupil of the Abbé Sicard, and in 1816 returned home, bringing with him Laurent Clerc, one of Sicard's ablest assistants. In April, 1817, the Connecticut Asylum was opened with seven pupils. Its success was so apparent that Congress soon made it an appropriation of land, and, on the supposition that it would suffice for the needs of the whole country, the name was changed to "American Asylum," which unfortunately it still bears. It is, however, neither the one nor the other, and the very suggestion of "asylum" has long since been repudiated by all friends of deaf-mutes. But it was soon found that other schools were needed, and they gradually increased till now they aggregate 49 schools, with 6,166 pupils and 375 instructors. Of these, six are articulation schools.

The growth of these institutions in the United States may be seen from the following table:

Date.	Number of institutions.	Number of pupils.	Number of teachers.
1857	20	1,721	95
1863	22	2,012	...
1866	24	2,469	119
1867	24	2,576	120
1868	27	2,898	170
1869	30	3,246	187
1870	34	3,784	223
1871	38	4,068	260
1872	36	4,253	271
1873	38	4,252	274
1874	44	4,892	290
1875	48	5,309	321
1876	49	5,010	304
1877	49	5,711	356
1878	49	6,166	375

The average time during which pupils are allowed to remain in the institutions is six or seven years, and the course of study is substantially that of our primary and grammar schools. Several institutions have a three years' additional course, comprising the ordinary high school studies. Instruction is also generally given in some trade. The majority of pupils, however, leave school even before the limit of seven years.

Our country has the honor of being the first to establish a higher grade of education for deaf-mutes. The National Deaf-Mute College, located at Kendall Green, near Washington, D. C., was established in 1864, and with a faculty consisting of a president and six professors, opens to its fifty students, from all parts of the country, substantially the same course of study as our other reputable colleges, and confers the degree of A.B. at graduation. Forty-two have already taken their degree, besides many others who have taken partial courses.

The late Prof. Henry, and President Gilman, of Johns Hopkins University, at a recent commencement, having had the opportunity of inspecting the examination papers of the various classes, pronounced them such as would do honor to the undergraduates of any college in the country, and its graduates are, perhaps, as successfully discharging the duties of life as any other equal number of college graduates. Many of the institutions have their own papers, and the American Annals of the Deaf and Dumb, edited by Prof. E. A. Fay, of the National College, contains in its issues for the past thirty years the most valuable papers in the English language, comprising discussions upon almost all questions relating to deaf-mutes. In many of the larger cities there are deaf-mute associations for religious or literary or social purposes, and in New York there is an Episcopal church for deaf-mutes, of which Rev. Thomas Gallaudet, D.D., is rector, while services are held by himself and his assistant in various parts of the country.

While deaf-mutism must always remain a calamity, yet these various alleviations of their condition have reduced that calamity to its minimum, and have brought the educated deaf-mute to the position where he need not fear to meet his hearing and speaking brethren in fair, honorable competition in most departments of human activity.

NOTE.—In the diagram on page 339, Fig. 1 shows the derivation of the symbols from the different vocal organs called into play. ɔ indicates that the lips are to be used; C the palate; U the tip of the tongue; ∩ the back of the tongue; while a line drawn across either of these symbols indicates that the corresponding vocal organ is to be closed, and —>, that they are to be opened and the breath emitted. I indicates vocalization of the emitted current of air, by throwing the vocal cords into vibration, and S a nasal tone.

Fig. 2 shows the combination of these symbols to indicate different consonantal effects.

Fig. 3 indicates the labials, P, B, M; the linguals, T, D, N; and the palatals, K, G, NG.

Fig. 4 shows the development of various sounds from the first attempt at vocalization on the part of a deaf-mute.

The vowel-sounds are indicated by hooks, dots, and transverse lines upon the sign of vocalization, as shown in Fig. 4.

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The Nose and its Diseases.

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THE NOSE.

THE nose is the organ which presides over the special sense of smell. It consists of two parts, the external—the prominent feature of the face—and the internal—the nasal cavities.

The external nose is composed of a triangular frame-work of bone and cartilage attached to the forehead and projecting from the centre of the face. The bones entering into its structure are the nasal bones, one on each side, and the nasal processes of the upper jaw-bones. The cartilages are one upper and one lower cartilage on each side, and the cartilage of the septum or partition (Figs. 95, 96). On its under surface are two oval-shaped open-

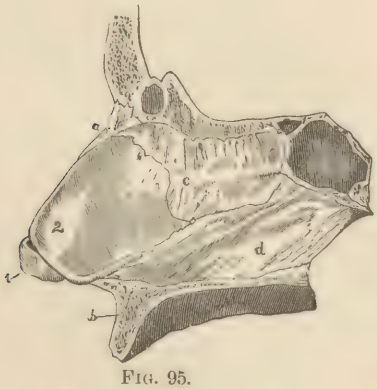

FIG. 95.

Fig. 96.

FIGURE 95.—The bony and cartilaginous partition of the nose, seen from the left side: *a*, right nasal bone; *b*, upper jaw-bone; *c*, perpendicular plate of the ethmoid bone; *d*, vomer; *e*, sphenoidal sinus; 1, inner part of the cartilage of the right side; 2, the cartilaginous portion of the septum or partition.

FIGURE 96.—Framework of the nose: *a*, nasal bone; *b*, part of upper jaw-bone; 1, upper, and 2, lower lateral cartilage.

ings—the nostrils, separated by a partition. The margins of the nostrils are provided with a number of stiff hairs which serve to prevent the passage of particles of dust, etc., with the inspired air.

The nasal cavities are two in number, and somewhat irregularly wedge-shaped. They extend from the nostrils in front to the

pharynx and upper surface of the soft palate behind. They are separated in the middle line by the partition before mentioned, composed of bone and cartilage. (Fig. 95.) The outer wall of each cavity is formed by the perpendicular portion of the palate-bone, by the upper jaw-bone, and by a portion of the ethmoid bone. On the outer wall we find three scroll-shaped projections of bone, called the superior, middle, and inferior turbinated or "spongy" bones, which are arranged horizontally, one above the other, and nearly parallel, as seen in Figs. 97 and 98 ; they project toward the central partition, and divide each cavity into three incomplete passages from before backward, called the superior, middle, and

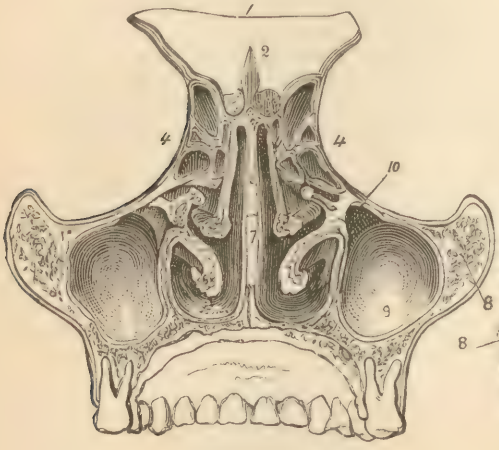

Fig. 97.

Fig. 98.

Figure 97.—Transverse vertical section of the nasal cavities, seen from behind: 1, part of the frontal bone; 2, crista galli; 3, perpendicular plate of the ethmoid bone; between 4 and 4 the ethmoid cells; 5, the right middle spongy or turbinated bone; 6, left lower spongy bone; 7, vomer; 8, cheek-bone; 9, maxillary sinus or antrum of Highmore; 10, its opening into the middle meatus or passage.

Figure 98.—Outer wall of the left nasal cavity, covered by the mucous membrane: 1, frontal bone; 2, left nasal bone; 3, upper jaw; 4, body of the sphenoid bone; 5, projection of the membrane covering the upper spongy or turbinated bone; 6, that of the middle; 7, that of the lower; 8, opening of the Eustachian tube going to the middle ear.

inferior meatus : the superior meatus lying between the superior and middle turbinated bones, the middle meatus between the middle and inferior, and the inferior meatus between the inferior turbinated bone and the floor of the cavities. This arrangement of the passages of the nasal cavities will be better understood by reference to the foregoing figures.

The roof of each cavity is narrow and arched, and the floor, which also forms the roof of the mouth, is made up by horizontal plates of bone projecting from the upper jaw and palate-bones,

and is completed by the upper surface of the soft palate. (See Figs. 97 and 98.) The openings in front are the nostrils, and those behind are two oval-shaped apertures called the posterior nares. (See Fig. 99). On the outer side of each posterior opening is found the opening of the Eustachian tube, the vent-hole of the inner cavity of the ear. (See Fig. 100.) This opening is closed, except during the act of swallowing, when it is drawn open by the contraction of the muscles brought into play by that act. This action is of importance in connection with the use of the nasal douche in the treatment of nasal catarrh.

The space between the posterior opening of the nose and the pharynx down to the level of the soft palate—generally called the vault of the pharynx—is really a portion of the nasal cavity.

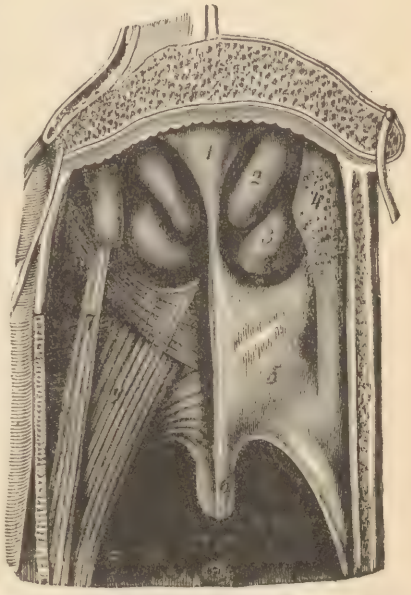

FIGURE 99.—The soft palate, as seen from behind.

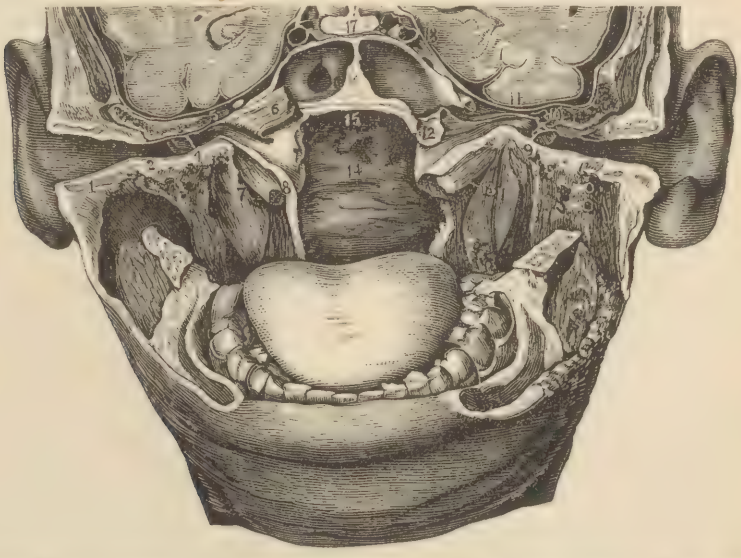

FIGURE 100.—Showing the Eustachian tubes passing from the back portion of the nasal cavity to the middle cavities of the ears.

At its upper portion is found a large mass of glands, resembling so much the tonsils in the back of the mouth, that it is often called the pharyngeal tonsil. These glands discharge freely the mucus, which serves to lubricate the food and facilitate its passage down the throat. They are liable to become inflamed in connection with diseases of the nose, and also separately.

There are several accessory cavities, which should be described in connection with the nasal cavities, communicating as they do with them by direct openings or passages, and which are oftentimes affected by the direct extension of disease commencing in the nose. These are, in the order of their importance—

The antrum of Highmore: a large, triangular-shaped cavity, hollowed out in the body of the upper jaw, and connected with the nasal cavity by an opening into the middle passage. (See Fig. 97.) The frontal sinuses: two irregular cavities which lie between the two plates of the frontal (or forehead) bone, and communicate with the nasal cavity by a rounded canal, which opens in the middle passage also; these sinuses are absent in the child, but develop with adult life. The ethmoidal and sphenoidal cells or cavities—found in the bodies of the bones of the same name—communicate with the nose by openings into the upper passage. In addition to these cavities, the tear-duct opens into the nasal cavity in the lower passage. (See Fig. 97.)

FIGURE 101.—The base of the skull, seen from above, the top having been removed, and showing, at A, A, the location of the olfactory bulbs and the openings through which the olfactory nerves pass to the nose.

The nasal cavities are lined by a mucous membrane, which is continuous with the lining membrane of the mouth, pharynx, and gullet, and extends also into the accessory cavities spoken of above.

The nose is the organ which presides over the special sense of smell; it also plays an important part in respiration and talking. The roof of the nasal cavities is formed in part, as we have seen (page 348), by the ethmoid bone. Lying upon what is called the cribriform plate of the ethmoid bone—one on either side—are the two olfactory bulbs (Fig. 101), connected with the brain by the olfactory nerves.

These olfactory bulbs are masses of nerve matter, and give off about fifteen or twenty branches, which, passing through the bone, are distributed to the mucous membrane of the upper third of the septum, and of the superior and middle turbinated bones (see Fig. 102); the membrane at this portion of the nasal cavity being thick and spongy, and containing a large number of glands, which keep it in a thoroughly moist condition. The nerves, after emerging from the ethmoid bone, divide and subdivide into numerous very small branches, until finally they terminate in very minute, hair-like extremities, which penetrate between the epithelial cells covering the mucous membrane, and reach the surface of the latter. These nerves are endowed only with the power of appreciating odors, and do not possess any general sensibility; the nasal cavity being supplied with other nerves which give it its

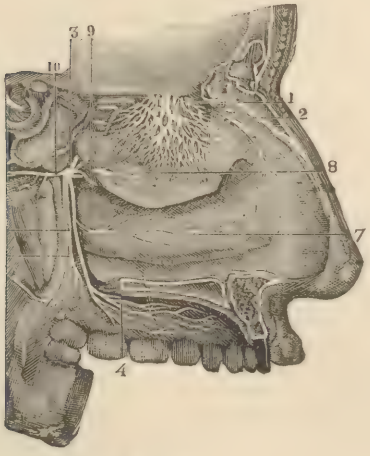

Fig. 102.

Fig. 103.

Figure 102.—Nerves of the outer wall of the nasal cavity: 1, network of the branches of the olfactory nerve; 2, branch of the nasal nerve; 3, spheno-palatine ganglion of the sympathetic system of nerves and the branches given off from it.

Figure 103.—Nerve cells and terminal nerve fibres of the olfactory region: *a*, epithelial cells; *b*, olfactory cells; *c*, the terminal rods; *e*, their extremities, composed of minute hairs.

sensibility; but the olfactory nerves possess the single power of the sense of smell. This is accomplished by contact of emanations from an odorous body with the terminal filaments of the nerve. Man, as a general thing, is not endowed with a very keen sense of smell, though it may be educated to a very high state; while, in dogs and many of the lower animals, this sense is very acute. Emanations from an odorous body can of course only reach the

nerve filaments by being carried in with the breath, anything which interferes, therefore, with breathing through the nose, such as a cold in the head, necessarily abolishes for the time the sense of smell. The mucous membrane in which the nerves are distributed must also be in a soft, moist condition; it being probable that the odorous particles are dissolved in the mucus which covers the membrane, and in a state of solution reach the nerve. The moist state of the membrane is provided for by the abundant supply of glands with which it is endowed. (See "Mucous Membranes.") The sense of smell is intimately related to the sense of taste; for, as we know, anything which impairs the sense of smell lessens also the sense of taste: a severe cold oftentimes completely destroys the ability to appreciate differences in flavor. No less marked is the fact often experienced that the flow of the gastric juice is stimulated and the appetite sharpened by what we call savory odors.

Another function of the nose is in talking. While the voice is formed in the larynx, and its pitch regulated by the action of the laryngeal muscles, its quality is entirely governed by the mouth, pharynx, and nasal cavities. Certain sounds are produced by vibrations confined almost entirely to the mouth, such as *a*, *o*, *i*; while others are almost purely nasal sounds, such as *n*, *m*. The great majority of sounds, however, are combinations of the two—the nasal predominating in some, the oral in others; and on the correct combination of the two depends a good voice. When a nasal sound is uttered the root of the tongue is raised against the soft palate and the cavity of the mouth is shut off from the current of air which passes from the larynx directly through the nose. When an oral sound is uttered, the soft palate is raised against the pharynx, and the current of air passes out through the mouth. An absence of the nasal character of the voice is quite as disagreeable to hear as the characteristic nasal twang for which Americans are so much ridiculed. A man talks through his nose who keeps open the nasal cavity in the utterance of all sounds. This may be due to mechanical interference with the free movement of the soft palate by tumors, destructive ulceration, or old scars; it may be due to paralysis of the palate following diphtheria, or some other cause, or it may be the result of habit. Again, a man is often said to talk through his nose when the fault is that he does *not* talk through his nose at all. This is the case when the nasal cavity is closed by a cold in the head, by one of the forms of chronic catarrh, or by the presence of tumors in the cavity or lying outside the cavity in such a way as to press the soft palate up against the pharynx, as sometimes happens in the case of

enlarged tonsils. This, again, may be due, in a measure, to habit.

The remaining function of the nose is in respiration. Normally, respiration should be conducted with the mouth closed, the current of air passing through the nose ; thus the air received by the lungs is warmer, moister, and cleaner. It is warmer because, in order to reach the lungs, it has to pass through a longer channel, and has had an opportunity of becoming warmed by the blood-warm surface over which it has passed. It is moister on account of having become charged somewhat with the vapor which it absorbs from the passages, and which is supplied by the abundant mucus coating the lining membrane of the nose, and also by the overflow of tears which is poured into the nasal cavity by the tear-duct. A moist air is always more grateful and less irritating to the delicate structures of the lungs than a dry air. It is cleaner in that the particles of dust and other matter which float in the atmosphere are arrested either by the hairs which are placed at the entrance of the nostrils, or by lodging against some of the irregularities or projections in the nose, where they can do far less harm than to the delicate lung tissues.

On the other hand, when respiration is carried on by the mouth, the converse holds true ; there is received into the lungs a cool, dry air, carrying with it such vicious matter as may happen to float in the atmosphere. Breathing through the mouth may be, to an extent, a habit, but in a majority of cases is due to mechanical interference with the free passage of air through the nose from some of the many diseases to which the nose is subject. In nursing children, this interference with nasal breathing becomes an extremely grave matter when they suffer from a cold in the head ; not being able to clear the nose, it becomes completely closed, and when the child takes the breast, it is very soon compelled to drop it to get breath, and between the struggle to breathe on the one hand, and the struggle to nurse on the other, the danger is very great that the child will succumb from simple lack of nourishment unless relieved by the re-establishment of normal nasal breathing

DISEASES OF THE NOSE.

We come now to the consideration of the diseases of the nose ; the most frequent and most prominent of these is *catarrh.* This term is derived from the Greek word καταῤῥέω, to flow down, and was used by the ancients to designate a discharge from the nose, which they supposed to "flow down" from the brain, whereby

the brain was thought to be relieved of deleterious matter; hence, therefore, arose the custom of greeting a sneeze with the hearty "God bless you," which survives to this day in many countries, the salutation meaning to convey a congratulation on the supposed clearing out to which the brain has been subjected. Properly speaking, catarrh is a term applied to that form of inflammation of a mucous membrane which is characterized by a fluid or semi-fluid discharge—in distinction from croupous or diphtheritic inflammations, which are marked by the formation of a false membrane—and may attack any mucous membrane in the body, as inflammation of the lining membrane of the bladder constitutes vesical catarrh, or *cystitis;* or inflammation of the lining of the larynx constitutes laryngeal catarrh, or *laryngitis.* Nasal catarrh, however, is of so much more frequent occurrence than any other form of catarrh, that popular usage simply designates it as "catarrh;" and when we speak of one suffering from catarrh, we understand the term always to refer to *nasal* catarrh. A better usage would be always, in referring to any form of catarrh, to add the proper prefix—as laryngeal catarrh, bronchial catarrh, etc.

Cold in the Head—Acute Nasal Catarrh—Acute Coryza.

This is an acute inflammation of the mucous membrane lining the nasal cavity, and in a majority of cases is due to "catching cold" by a too sudden cooling of the body after being over-heated, by sitting or sleeping in a draught, or by wetting the feet; in other cases it may be due to breathing an atmosphere laden with particles of dust or other irritating matter; or, again, it may be caused by inhaling irritating gases, such as ammonia, iodine, etc.

Some persons are peculiarly liable to a cold in the head from very slight causes; others manifest marked tendencies under which one person will have an attack upon entering a room containing even the smallest amount of ipecac in powder; in another the attack is induced by iodine; in another, by musk. These individual peculiarities, however, are exceedingly rare. What occurs in an acute coryza, is as follows:

Symptoms.—At the first onset of the attack the mucous membrane becomes very much congested, the blood-vessels are swollen and distended with blood, and the discharge of mucus is arrested, the membrane presenting a dry, glazed appearance. At the same time there is experienced a feeling of fulness about the nose, with a dry, burning, smarting sensation, with a disposition to sneeze; each breath of air drawn through the nose feels hot and irritating; there is also more or less fever, according to the

severity of the attack, manifesting itself in a feeling of lassitude and weariness with pains in the limbs, headache, hot skin, and chilly sensations. If the inflammation extends to the frontal sinuses (see Fig. 102), the pain at the root of the nose and lower part of the forehead is often very severe in character; if the cavities of the upper jaw-bone are affected, there is more or less intense neuralgic pain in the face; if the tear-ducts are involved, there is pain and tenderness in the eyeball, with intolerance of light.

This stage of the attack lasts from six to twenty-four hours, and is followed by a profuse watery discharge, the distended blood-vessels becoming relieved by the escape through their walls of the watery portion of the blood (the serum). This contains a considerable amount of saline matter, which gives to the discharge its salty taste and its acrid, irritating quality. The glands soon resume their function, and discharge a large amount of mucus; the little epithelial cells, being produced in increased numbers under the stimulus of the inflammation, are thrown off in corresponding proportion, and we have the watery discharge, soon changing to a grayish, transparent mucus; and this, again, to a discharge more resembling matter or pus. The duration of the attack is from five to ten days, and may either end in complete restoration of the parts to a healthy state, or may lapse into a chronic catarrh, as the result of the continued action of the original exciting cause, or of a lowered state of the system, which fails to throw off the disease as readily as it does when in a state of vigorous health.

Prevention.—Those who are especially liable to take cold should always exercise an unusual care in the avoidance of those causes which experience teaches them may give rise to an attack of acute coryza; and yet an excessive zeal in this direction, showing itself in muffling up the head and neck in wraps on all occasions of even slight exposure, is as much to be avoided as the opposite extreme. No one ever contracted a cold from exposure of the hands or face; simply because the hands and face are accustomed to exposure, and are therefore inured to it. An amount of protection of the body necessary for comfort, and no more, is a safe rule to follow. Excessive covering induces perspiration, which is an indication of excessive bodily heat, and involves the danger of a too sudden cooling, which is probably the most frequent cause of taking cold. This sudden cooling of the body is what occurs from getting the feet wet, sitting in a draft, or going from a warm room into the open air, and is, of course, always to be guarded against. During sleep, it should be remembered, the body is peculiarly susceptible, and any cause which may act on it during waking hours, will act with greater force during sleep.

Much may be accomplished, in the way of preventing colds, by a daily bathing of the head, neck, and shoulders with cold water, either with a sponge, or by dashing the water over the parts, and following it by a brisk rubbing with a coarse towel. For those especially liable to cold, this simple device is well worth resorting to; for, if persisted in, through warm and cold seasons, it will often secure a very satisfactory immunity from the attacks.

Treatment.—As regards the active treatment of a cold in the head, it is probable that a large proportion of cases are allowed to run their course without any attempt to lessen the severity or shorten the duration of the attack; this is much to be deprecated, as it is undoubtedly true that a large number of cases of chronic catarrh are due to neglected colds, and one attack particularly, if neglected, leaves an especial liability to a second one.

If active measures are resorted to, on the first onset of the disease, for inducing free and copious perspiration, the attack may be broken up. This can only be accomplished within the first twelve or twenty-four hours before the discharge has fully set in, and may be brought on by the free use of hot drinks—such as hot lemonade, a decoction of thoroughwort, or chamomile tea, and the like, with the aid of a hot foot-bath, and, perhaps, ten grains of Dover's powder (for an adult), if the attack is severe or the pain and headache very distressing. The hot drinks should be taken freely, and in pretty large quantity. The foot-bath may be continued until there is felt a decided warmth throughout the system, and the body should then be thoroughly covered with blankets in bed.

The danger of taking a fresh cold after a "sweat" is not very great if one remain in-doors for several hours after rising in the morning. After the first or second day has passed, and the discharge has set in thoroughly, mild, astringent applications may be used to limit it and reduce the inflammation of the mucous membrane and allay pain, such as the sub-carbonate or sub-nitrate of bismuth, tannin or powdered chlorate of potash; one part to four or six of white sugar or powdered gum-arabic, to be used in the form of snuff. If the pain is severe, morphine may be added to either of the above in the proportion of one grain to one dessert-spoonful of the whole. The snuff should be used after cleansing the nose by moderate blowing. Violent blowing of the nose should be avoided. The drawing into the nose of watery solution is liable to irritate the parts in acute catarrh, and should be resorted to sparingly, and plain water should never be used—a solution of common salt or baking soda, one teaspoonful to the pint of warm water being more grateful and less irritating. When, however, the discharge is profuse and yellowish in character, a solution in

tepid water of alum, borax, or chlorate of potash may be used of the strength of a half-teaspoonful in a pint, the solution being held in the hollow of the hand and snuffed up through the nostril.

In nursing children, when the closure of the nasal breathing space gives rise to such serious consequences (see page 353), a warm

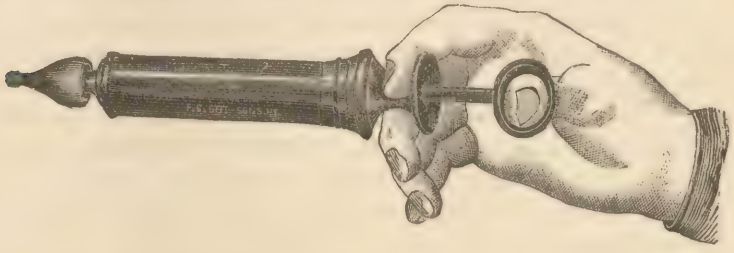

FIGURE 104.—Hard rubber syringe, suited for injecting fluids into the nose, etc.

solution of soda or salt, as above, may be thrown gently into the nostril and against the swollen membrane, the tip of the nose being lifted, and the nozzle of the syringe being held about a half inch away, and not inserted into the nostril. The child should be in a sitting position, with the head bent slightly forward. For very young children a better and safer instrument than the syringe is the atomizer, such as is used for spraying cologne—the solution used being the same as above. This may be followed by throwing in a small amount of astringent powder, such as bismuth and powdered sugar, in equal parts; alum, tannin, or borax, one part in ten of powdered sugar, the application being repeated three or four times daily The bridge of the nose may also be anointed with oil of sweet-marjoram or goose-grease. Nourishment should always be given by spoon to a nursling, if the child finds any difficulty in sucking sufficient food from the breast or bottle.

FIGURE 105.—Atomizer for throwing a spray of medicated fluid into the nose, etc.

Chronic Nasal Catarrh—Chronic Coryza.

This affection is a chronic inflammation of the mucous membrane lining the nasal cavities, and is, in the large majority of cases, due to repeated attacks of acute coryza, which, each time leaving the mucous membrane in an impaired condition, finally results in a catarrhal discharge, which continues. In its milder form it is characterized by a more or less profuse discharge from the nose, consisting either of thick, grayish mucus, or of a yellowish more purulent substance, and is marked by especial liability to the contraction of a fresh cold, which pursues the ordinary course of an acute coryza, with the exception that, in subsiding, it leaves behind the chronic trouble. The discharge is either gotten rid of by blowing the nose, or is snuffed back into the throat and hawked out through the mouth. If the posterior portion of the nasal cavity with the glands at the vault of the pharynx are involved, there is, in addition to the discharge through the nostrils, an exceedingly thick tenacious mucus poured out from the glands located there, which is gotten rid of with considerable difficulty; falling down between the soft palate and posterior wall of the pharynx, it excites an effort at swallowing, which generally fails to remove the mass, and it is only detached by a sort of nasal screatus which draws it down into the throat, where it is either swallowed, or, as it should be, is hawked up into the mouth and expectorated; or, on the other hand, the discharge may be exceedingly copious, in which case it is of a thinner and less tenacious character, constantly dropping down the throat and causing a great deal of irritation of the parts below. These symptoms vary very much with the daily changes of the weather, and especially with the changes of the season, being much aggravated by the damp, chilly atmosphere of spring and fall; while during the warm, dry weather of summer, they are so far in abeyance as to cause very little, if any, annoyance whatever.

While many cases of chronic coryza may continue for years without manifesting anything more than the above-mentioned symptoms, there is a tendency in all cases to the development of the later form of the disease, which is a thickening or over-growth of the mucous membrane. This thickening consists mainly of a deposit in the deeper layers of the membrane of connective tissue, —small, thread-like fibres, which, once deposited and organized, are never absorbed, and can only be removed by surgical means. This thickening of the membrane is greatest in extent over the scroll-like bones (the turbinated) which separate the cavity into the

three incomplete passages running from before backward; and the growth is largely toward the septum or partition wall of the nose. As will be easily seen, this thickened condition of the membrane results in a more or less marked interference with breathing through the nose, giving rise to the symptoms spoken of in connection with the functions of the nose in breathing and in speaking. (See page 352 et seq.) The excessive secretion still continues, but, owing to this obstruction, is removed with considerable difficulty, and accumulates in the cavity, thereby aggravating the obstruction. The diminished current of air through the nose is compensated by breathing through the mouth. This causes an abnormal dryness of the throat, and is a source of no little annoyance; it also gives rise to the familiar phenomenon of *snoring;* which also is caused by any affection which interferes with free nasal breathing, such as tumors in the nose or in the upper pharynx, enlarged tonsils, etc.

The explanation of a snore is very simple: the current of air through the nose above, and the mouth below, meeting at the border of the soft palate, throw it into vibration; and in all cases snoring is probably due to some of the above enumerated causes of obstruction to nasal breathing, or to a habit persisting after the removal of a temporary cause. The characteristic voice, and peculiar half-silly facial expression, due to a "stopped-up" nose, are familiar to all, and need no comment.

A still more chronic form of nasal catarrh is the so-called "dry catarrh;" this, in a large majority of cases, if not in all, results from the form previously described, and is characterized by an abnormal dryness of the lining mucous membrane of the nose. As shown before, the thickened condition of the mucous membrane, in the previously described form of catarrh, is due to a deposit of connective tissue; now, wherever this is deposited, and becomes organized, it subsequently contracts, as is seen in an ordinary scar resulting from a cut or burn; as this takes place in the nose, we have the thickened condition of the mucous membrane disappearing, and, instead of it, the membrane becomes shrunken; the glands which furnish the mucous discharge are in large part destroyed, and the secretion of mucus becomes scanty, the membrane becomes dry and parched, the diminished amount of mucus secreted dries rapidly, and crusts are formed in the nose, which are got out with difficulty; there is considerable pain of a burning, smarting character, due partially to the dry condition of the membrane, and also to pressure on the nerves; the sense of smell is greatly impaired if not entirely abolished, a moist condition of the nasal membrane being, as before noticed, essential to this function.

The breath, as a rule, is not generally affected in this form of catarrh, or, indeed, in any of the above described forms of simple nasal catarrh, though in the "dry catarrh" there is often noticed a

FIGURE 106.—Nasal douche.

FIGURE 107.—Nasal douche.

peculiar musty odor, which is not agreeable. Those forms of catarrh which are characterized by fetid breath and offensive discharges will be described under the heads of Ozæna and Ulceration of the Nasal Cavities.

FIGURE 108.—Mode of using the nasal douche.

Treatment.—All cases of chronic catarrh are characterized by a liability to acute attacks; these attacks should be guarded against by the simple rules of hygiene, as noticed in connection with acute coryza. Various methods of reaching the nasal cavities for treatment are resorted to—such as the nasal douche, nasal syringes, spray producers, snuffs, and vapors.

The *nasal douche* consists of a bottle or cup, to the lower portion of which is attached a rubber tube, ending in a nozzle which is made to fit

into the nostril. The cup or reservoir being filled with the fluid designed to be used, and the nozzle being inserted in the nostril, the cup is raised just above the head, which is bent over a bowl, and the fluid flows into one nasal cavity, and, gradually filling it, rises and flows over the partition wall or septum, and out of the other nostril. *Breathing must be carried on through the open mouth, and no movement of swallowing must be made during the use of the nasal douche.* While the device is undoubtedly an efficient aid in some cases of nasal trouble, there is, however, a danger attending its use, viz.: that the fluid used may pass into the Eustachian tube—the passage which leads from the throat to the internal ear—and excite inflammation which may extend to the inner cavity of the ear, and produce deafness—an accident, the gravity of which cannot be over-estimated, and many physicians condemn the use of the nasal douche on account of this danger. Its efficiency being somewhat limited, and its danger being great, the nasal douche should therefore be used with the greatest care, if used at all, and should be abandoned the instant any symptoms occur with reference to the ear.

The *syringe* is certainly safer, and more efficient; but unfortunately, not so easily used by the patient, except after considerable training. It consists of an ordinary barrel syringe, with a

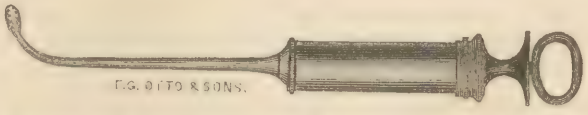

FIGURE 109.—Syringe with nozzle for injecting fluids into the nasal cavity from behind.

nozzle curved in such manner that it may be passed up behind the soft palate, and throw a stream from behind forward through the nasal cavity and out at the nostril.

The *atomizer* is a simple device by which the medicated fluid is broken into fine spray and thrown into the cavity by a strong current of air; there are many varieties, but all on the same principle as the ordinary "cologne spray" (see Fig. 105). Besides these methods, fluids may be applied to the nose by an ordinary camel's-hair brush provided with a handle, or by cotton wrapped in a probe; or powders may be drawn in by snuffing; or, in the case of children, the latter may be blown in by means of a tube of glass, paper, or goose-quill. Ordinarily, it is well to be somewhat careful in commencing to use applications to the nose. A simple case of chronic nasal catarrh may often be overcome by following the general directions laid down for the prevention of the repeated at-

tacks of acute catarrh. If these measures fail, and the discharge continues, resort may be had to some of the milder astringents, such as tannin, five grains in an ounce of water. Borax, sulphate of zinc, or alum, of the same strength, are efficient remedies. They may be used with the atomizer, which should be preferred to other methods in the earlier stages of the disease. If this fails, resort may be had to the syringe or douche. If there is very much secretion, and it shows a tendency to lodge in the cavity, an effort should be made to clear the nose before making the application. Oftentimes the handkerchief is sufficient, but if simply blowing the nose does not thoroughly cleanse it, a solution of common table-salt or baking-soda may be sprayed into the nose : or the fluid being held in the hollow of the hand to the nostril, it may be snuffed up. If the solution irritates, the strength should be reduced by adding more water, and if it still causes any smarting, the use of a watery solution should be abandoned, and resort be had to snuffs ; these may be made up with powdered starch, sugar, or gum-arabic, of the same strength as in water, or even stronger : as tannin, ten to twenty grains in an ounce of starch or sugar ; ten grains of alum or borax, with the same proportion of starch or sugar, or bismuth, pure or half strength.

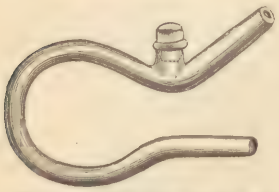

FIGURE 110.—Glass tube to enable a patient to blow a powder into his own nose : A, opening for powder, closed by a cork ; B, end inserted into nose ; C, end held in mouth of the patient.

If the disease has gone on to the stage of thickening of the mucous membrane, it will be necessary to use some of the remedies which promote absorption—following the same directions as before as to cleansing, and as to the avoidance of any cause of irritation or pain in the parts. Among these are muriate of ammonia, five to fifteen grains; chloride of zinc, one grain ; tincture of iodine, one to ten drops ; iodide or bromide of potassium, three to five grains; nitrate of silver, one grain—all to an ounce of water. The addition of glycerine to any of the above named, one drachm to the ounce, will prove an excellent aid to the efficacy of the remedy. In the earlier stage of thickening, the persistent use of these remedies will prove of good service ; but in the later stages, when the thickened tissue becomes thoroughly organized, it is doubtful if any local application will be of service ; the only relief will be in surgical means, at the hands of a skilful physician, the parts requiring to be destroyed by caustics or removed with forceps.

"*Dry catarrh*" is an extremely obstinate and chronic affection; yet much may be done in the way of relief, if not of cure, by the

long-continued use of local applications at the hands of the patient.

In these cases, the secretion being scanty and closely adherent, it will require the use of the syringe for cleansing purposes. But after the parts are thoroughly cleansed, the spray will be found an excellent method of making the application of the especial medication required. This form of catarrh being characterized by abnormal dryness and deficiency of secretion, the object of treatment is to moisten the membrane and stimulate the secreting glands into healthy action. The remedies of especial service in this direction are, carbolic acid, one to three grains; kreasote, of the same strength; tinct. sanguinaria (blood root), ten to thirty drops; tinct. myrrh, twenty to thirty drops; or carbonate of ammonia, one to five grains—all to one ounce of water.

The dryness may be relieved by the inhalation of steam; and it is well at all times that persons subject to dry catarrh should breathe an atmosphere pretty well charged with moisture, if it can be done.

Nasal catarrh is often looked upon as an incurable disease. This is undoubtedly a mistake. It is probable that a very large proportion of the cases of chronic nasal catarrh are curable, but, in the effort to promote a cure sight should never be lost of the fact that a very important element in the treatment is the prevention of the fresh attacks that are so liable to occur repeatedly, and that the local treatment will always fail to accomplish the desired end unless the most careful observance is paid to the general rules of hygiene laid down before; and, in addition, it should be remembered that the cure of a nasal catarrh may be often retarded, if not absolutely prevented by the existence of some concurrent disorder—oftentimes of a comparatively trivial character—such as constipation, dyspepsia, etc.

Stink-Nose, or Ozæna.

Although this disease is generally classed as one of the varieties of nasal catarrh, it is considered under a separate head, because, in truth, the source of the disease is not in the nasal cavities, but in the accessory cavities—the antrum, the sphenoidal sinuses, etc., although its prominent manifestation is in the nose.

Symptoms.—This complaint is, in its origin, a catarrhal inflammation of the mucous membrane lining, one of the accessory cavities of the nose.

Owing to the character of the part affected, being an almost completely closed cavity, the secretion very soon becomes pus, and, being retained, undergoes degeneration, which gives it its

extremely fetid, offensive odor. This discharge, escaping from the cavity through the opening by which it communicates with the nose, pours over the lining membrane of the nose, coating it with a thin, greenish-yellow secretion, which, adhering very closely, is retained in the nasal cavity and dries, forming crusts or masses of foul-smelling, offensive matter, which are detached with considerable difficulty at intervals of one to three or four days and voided—but only to be renewed again. There is not, ordinarily, any great obstruction to breathing through the nose; on the contrary, as a rule, the cavity is quite open and capacious. The sense of smell is generally seriously impaired, if not entirely lost. There is no pain (more than the sense of fulness) or discomfort in the special cavity involved. If the frontal sinus is inflamed, the pain and fulness is referred to the bridge of the nose and the lower part of the forehead. If the cavity of the jaw (the antrum of Highmore) is the seat of the disease, these sensations are referred to the cheek-bone, often to the extent of severe neuralgic pains. Usually, however, the prominent symptom is the offensive discharge and the fetid breath, which, though not generally perceived by the sufferers themselves, is so powerful and penetrating that it is very noticeable at a distance. As a rule, ulceration of the mucous membrane does not occur in this disease, and when the discharge has been thoroughly removed, the cavity presents a fairly healthy appearance. This should be recognized in all cases, as the treatment of ozæna is based on entirely different principles from that of ulcerations of the nasal cavity.

Treatment.—This is one of the most obstinate of all diseases of the nasal cavities, and whereas very much can be accomplished in the correction of its most prominent and distressing features, a permanent and complete cure can only be attained after a long-continued and faithfully followed course of treatment.

In making applications, the syringe will be found most efficient, used either to throw the medicated fluid into the nose behind the palate, or directly into the nostril. In order to detach the dry secretion the stream must be thrown with considerable force. The fluids to be used for cleansing purposes are here much the same as in catarrh: a solution of common salt, a teaspoonful in a pint of water; baking-soda (bicarbonate of soda), or bicarbonate of potassa, of the same strength. This cleansing should in all cases be thoroughly and carefully done, otherwise, any treatment will be of little avail; afterward there may be thrown in by the atomizer, by blowing or by the douche, a disinfecting solution, such as carbolic acid or kreasote, five to twenty drops in a half-pint of water, or salicylic acid, one or two grains in an ounce of water. If the odor

is very offensive, solution of chlorinated soda (Labarraque's solution) may be used, one or two teaspoonfuls in a pint of water. Permanganate of potassa is an excellent application, five to twenty grains in an ounce of water.

These remedies should be used daily, or even oftener, according to the severity of the disease and the rapidity of the formation of the fetid secretions.

Ulceration of the Nasal Cavity.

This constitutes a totally distinct form of disease from the one previously described, although, in many of its symptoms, the resemblance is very close. Its most frequent cause is syphilis, and it occurs from two to ten years after the disease has been contracted. Its favorite location is on the septum or partition of the nose and near the nostril; it may, however, have its seat in any portion of the cavity. Commencing as a simple abscess in the deeper portion of the mucous membrane, which breaks and discharges matter, it rapidly develops into an open ulcer, with a free discharge, and, destroying the tissues rapidly, eats its way through the whole membrane down to the bone or cartilage, which it also attacks and destroys, when we have what is called *necrosis*, or death of the bone. The bone is discharged in small pieces, which are recognized as small, blackish-gray masses in the matter voided, or there may come away large pieces, or even the whole of one of the scroll-like bones (the turbinated). The ulceration is rapid in its destructive advance, and is attended with a profuse mattery discharge, which, drying and adhering closely to the surface of the ulcer, is gradually built up from below by the fresh matter poured out, until there is formed a large mass or crust, made up of matter, blood, particles of dead bone and membrane destroyed by the ulcer, and discolored also by the particles of dust from the air drawn in with the breath. These may be removed at intervals of from one to three or four days by the efforts of the sufferer, or they may adhere so closely that they can only be extracted by a physician; their odor is simply intolerable, and their appearance nauseating to an extreme degree.

Another form of ulceration in the nose is that due to scrofula. In this disease the progress is much slower; the amount of destruction is much less; the activity of the ulceration, as in syphilis, is absent. We have a slow, sluggish form of disease, but still the same tendency to the formation of offensive masses, the same fetid breath, etc. To the physician familiar with the two diseases, the characteristic difference would be recognized by an examination;

the sufferer can easily make the diagnosis, however. On the one hand, if the disease is syphilis, there is the knowledge of his early symptoms, the primary sore, the hard chancre, the eruption, etc. If, on the other hand, the disease be scrofulous, there will be found existing with it the ordinary symptoms of the disease (see Scrofula), and also, in a marked degree, the enlarged glands in the neck and at the angle of the jaw.

Ulceration may be due also to the presence of a foreign body in the nose. The variety of articles which have been removed from the nose, after remaining even many years without recognition, is very great. A tooth, an insect, a button, a small pebble-stone, have been known to lie in the nose for periods of from five to twenty years, and, on removal, the sufferer, from what was supposed to be ozæna, has been entirely cured. Ulceration from this cause is characterized by a mattery discharge, an offensive breath, more or less obstruction to breathing through the nose; but all in a less degree than in syphilitic or scrofulous disease. The ulcer does not extend, rarely involves destruction of cartilage or bone, and heals kindly on the removal of the foreign body.

Ulceration, again, may occur from fracture of one of the bones or cartilages of the nose, resulting in death of bone. In this case there occur the same symptoms as in the other form of ulceration, and, in addition, the symptoms resulting from the fracture—deformity, pain, etc.

It is probable that all cases of ulceration may be traced to one of the above causes, except those rare cases in which we have necrosis of bone due to inhaling phosphorus fumes, as sometimes occurs among those engaged in the manufacture of friction matches, or from lead poisoning, or other unusual and obscure cause.

The Treatment is of course based on the cause of the disease. In syphilis, iodide of potassium and mercury should be given, and continued for four to six months, to insure complete arrest and cure. In scrofula, cod-liver oil, iodide of iron, the hypophosphite of lime and general tonics should be administered, and the general rules followed out as given in the article on Scrofula.

If there is a foreign body in the nose, the fact can only be ascertained by such a thorough examination as will commonly require the assistance of a physician. As a rule, there is no further treatment required besides the removal of the foreign body.

In necrosis the dead bone should be removed by a surgeon as soon as feasible.

The *local treatment* in all forms of ulceration is much the same as given in the article on Ozæna (page 364), and should in all cases be resorted to, in addition to the general treatment di-

rected, in order to limit as far as possible and arrest the destruction of tissue. A very valuable aid to the action of the remedies advised is the use of iodoform. This is a yellow powder of a rather disagreeable odor, but its curative powers are so great in all forms of ulceration of mucous membranes, that its disagreeable odor should be tolerated for the sake of the great benefit resulting from its use. It may be applied in the form of powder, or it may be mixed with vaseline or simple ointment: one part in four or five, and may be applied with the finger if the ulcer is near the nostril.

Tumors of the Nasal Cavity.

The tumors that may occur in the nose are warts, polypi, fibrous tumors, and cancer.

Warts.—These are the same as the ordinary warts which occur on the hands, and may occasionally be noticed just within the nostril, at the junction of the skin and the mucous membrane. They never occur deeply within the cavity. They occasion but slight annoyance by their presence, and are mainly of importance, from the fact that they bleed pretty freely if they are picked or broken. Occurring as they do most commonly in children, this may lead to serious accidents from their habit of constantly picking at anything that may happen to lie in the nostril.

The Treatment is the same as that of ordinary warts occurring elsewhere, and consists in the daily application of acetic acid; or in their removal by scissors, and the cauterization of the cut surface with strong nitric acid, all of which should be left to a physician.

Polypus.—Nasal polypus, or, as it is sometimes called, *gelatinous polypus*, is the most common of all tumors having their seat in the nasal cavity. Taking their origin in some small point of localized inflammation — probably one of the minute glands of the mucous membrane—they grow with more or less rapidity, until, by their own weight, they sink down toward the floor of the cavity, becoming elongated and pear-shaped; their attachment to the part from which they sprang being maintained by a narrow portion, called the pedicle or stalk. As they increase in size, they mould themselves to the cavity in which they grow. In a very large majority of cases their attachment is to the middle turbinated bone,

FIGURE 111.—Mucous polypi.

and about midway of the passage, and never to the septum. They generally occur in groups of from three or four to eight or ten, and are rarely confined to one cavity.

They are soft and yielding to the touch, and of a grayish color, being composed of *mucin*, the main constituent of mucus, and a few loose fibres of connective tissue.

The main **symptoms** of their existence are, the obstruction of the nose, more or less complete, according to their size, the discharge of a clear watery fluid, and their peculiar action under atmospheric changes, by which they absorb moisture and swell up during damp weather.

They can generally be seen by looking into the nostril, the tip of the nose being raised, and are easily recognized by their color, which is a grayish-white, almost identical with that of mucus or phlegm; by their movability—a probe being pressed against them, they are seen to move freely; by their semi-elasticity—being indented by the probe, the indentations disappearing slowly.

Treatment.—The only treatment for nasal polypus is removal at the hands of a physician, no local application being of any avail for relief even, much less for cure. The operation is not a difficult one, and is not attended with much pain.

Fibrous Tumors.—These tumors are of a far more serious character than those previously described. They occur in the upper portion of the nasal cavity, or in the upper pharynx, and grow very slowly, their development being a matter of years ; but it is a growth which nothing can withstand, carrying before it, in its relentless march, membrane, cartilage, bone, whatever it may meet.

The Symptoms are those due to nasal obstruction, without any noticeable catarrhal discharge, and, in addition, the special deformity that may be caused by the tumor according to its location. If it is in the upper part of the cavity, there occurs that peculiar deformity called a frog-face, due to a spreading of the root of the nose. If the tumor is lower down, it may crowd out one or the other of the cheek-bones.

The only treatment is removal by the surgeon's knife.

Cancer in the nose is recognized by the lancinating pain, the fetid, peculiarly offensive discharge, in connection with a peculiar complexion and appearance of the patient called the "cancerous cachexia," as described elsewhere.

Deviation of the Septum.

This is a condition in which the septum of the nose deviates from the median line. Probably in a majority of people there is a slight deviation from the centre, but in some cases the deformity exists to such an extent that the projecting part may touch the outer wall of the nose, completely closing the nostril of that side. This condition might easily be mistaken for the existence of a tumor, but an inspection of the other side will easily correct the apprehension, as the corresponding depression will then be seen. This deformity is generally present at birth, though it is often the result of an injury; it has been caused by the habit of blowing the nose with the finger pressed against the nostril.

The only treatment for this condition is an operation at the hands of a surgeon, and consists in the removal of that portion of the septum which is deflected. This, of course, is only resorted to in those cases in which the deviation gives rise to obstruction of the nose.

Perforation of Septum.

This consists in an opening through the septum from one cavity to the other. It is the result of ulceration and necrosis, and in a majority of cases is due to syphilis. It may be small in extent, or it may involve both the cartilaginous and bony portion of the septum. Its existence is not serious, and gives rise to no symptoms.

Foreign Bodies in the Nose.

The vicious habit young children sometimes fall into of putting small objects into the nose is not more remarkable than the variety of things which they put into the mouth—with this difference though, that their removal from the mouth is quite an easy matter, while from the nose it is oftentimes quite difficult, owing to the fact that the entrance is the smallest part. Moreover, a timid child oftentimes refrains from telling what has happened; and an object which might easily have been removed at the outset, becomes firmly fixed by the swelling of the mucous membrane excited by its presence.

Treatment.—The first effort at removal of a foreign body from the nose should always be made by blowing the nose—the free nostril being closed by the finger. In case the child is too young,

or too much alarmed to do this, his nose can be blown for him in the following manner: While the head is held steadily between the knees of an assistant, let the operator apply his or her lips closely over the mouth of the child (if it is crying, so much the better), and blow forcibly into it. One effort is commonly all that is needed. It is better not to close the free nostril, since it avoids the danger of a possible injury to the ear of the child, from a too great pressure on the ear-drum. If blowing the nose fails, some simple instrument may be used for removing the object by the nostril. A hair-pin is ordinarily the first and most convenient aid, but only the looped end should be used, unless the object, like a button, has a hole or eye into which a hook can be inserted; in which case one of the pointed ends may be used, being bent into a hook. With care the two points may be used as tweezers. In no case should any force be used. Blind groping about in the nasal cavity should also be avoided; and if the body is not easily removed or has made its way deeply into the nose, its removal should be accomplished by a surgeon. If the object has remained long enough to cause swelling of the parts, attempts at removal should be delayed until the swelling has subsided, their presence for days or even weeks not giving rise to any serious or permanent results; but remaining, as they often do, for a much longer period, they cause ulceration, with its fetid discharges and offensive breath, as before described (page 363).

Bleeding from the Nose—Epistaxis.

The mucous membrane of the nose is very abundantly supplied with blood-vessels, more so than that of any other portion of the air-passages; and owing to its exposed position and liability to injury on irritation, bleeding is of extremely frequent occurrence. It may be the result of direct violence, as a blow or fall; it may occur from picking the nose when it is the seat of disease or irritation; or it may be due to an effort on the part of nature to relieve the distended blood-vessels of the head when, from any cause, there is too much blood circulating in the brain. In this case the bleeding is preceded by a sense of pain and fulness about the forehead and eyes, headache, dizziness or vertigo, intolerance of light, etc.; all of the symptoms disappearing with the escape of blood.

Nose-bleed also frequently attends the onset of typhoid and remittent fever, in which case it is accompanied by the ordinary symptoms of those diseases. It is also a prominent feature of scurvy, when there will also, very likely, be bleeding from the gums and discolored blood-spots on the skin. It is said to take the

place, sometimes, of the monthly period, recurring, as it does, each month at the time when the natural flow should appear, this being from some cause suppressed, constituting the so-called "vicarious menstruation." It is common, also, to that class of persons called "bleeders," who bleed freely, and often profusely, from a slight wound, or even a scratch.

If the bleeding is due to a local cause, it is generally confined to one nostril; but if the cause is in a general condition, such as fever, scurvy, congestion of the blood-vessels of the head, etc., the flow is from both sides of the nose. It usually trickles in drops, or flows in a small stream, and is not attended by any great danger; but it may become very serious, or even fatal by its amount or long continuance without being arrested.

Treatment.—A nose-bleed, probably in a majority of cases, has a tendency to cease spontaneously. Still, it is not well to trust to this tendency, for if it lasts too long it is far more difficult to arrest it than at the outset; hence simple measures should always be resorted to, such as pressing the nose firmly between a thumb and finger, thus closing the nostril and much of the nasal cavity, at the same time raising the hand of the same side as high as possible. This position should be maintained for from five to ten minutes, or even longer, the object of the pressure being to enable a clot to form by which the bleeding vessels may be plugged. Of course, blowing the nose should be avoided, not only during the bleeding, but for some hours afterward, the effect of such an act being to dislodge the clot and re-establish the trouble. Trial may be made at the same time of the application of ice to the bridge of the nose, and also to the nape of the neck; in the absence of ice a piece of cold metal may be used. These measures failing, a further resort is to tie a cord around one of the limbs, thus lessening the amount of blood which circulates in the vessels of the head by detaining it in the extremities. If the hemorrhage is not arrested by these devices, it will be necessary to use local applications, such as ice-water, weak solutions of alum, tannin, iron, etc., thrown into the affected nostrils by a syringe, pledgets of cotton saturated with the astringent and passed into the nostril, or plugging the nose before and behind. This latter, however, will require the services of a physician, who should always be summoned when the attack is not arrested by the simple devices above-mentioned. [See also Chapter on Accidents and Emergencies.]

Fracture of the Bones of the Nose.

In addition to a simple nose-bleed occurring from a fall or blow, the bones of the nose may be broken. When this takes place, the parts become so rapidly and so greatly swollen, that before the arrival of the surgeon it may become very difficult to recognize the true condition or to adjust the parts. It is desirable, therefore, that some bystander should know what ought to be done.

Symptoms.—The fracture may be recognized by the deformity which attends it, the natural outline being altered, the bridge being sunken at the point where the bone is broken, and also by the grating sensation which may be felt on taking the bridge between the fingers and making slight pressure—due to the grating of the broken edges on each other.

Treatment.—The parts are adjusted by passing a slender instrument, such as a pen-holder or lead-pencil into the nostril, and lifting the sunken fragments into place, and then packing soft cotton under them in such a manner as to retain them. The swelling of the parts may be controlled by the application of cloths wet with ice-water, and frequently changed; or if ice is not convenient, water may be used as hot as can be borne with comfort and continued for at least half an hour.

With the greatest possible care in the treatment of a broken nose, there is usually some deformity remaining permanently.

Loss of the Sense of Smell—Anosmia.

The sense of smell, depending, as it does, on the contact of particles of odorous bodies with the minute extremities of the olfactory nerve, is necessarily abolished or impaired by anything which interferes with the access of these particles to the membrane of the nose; or, again, by anything which impairs or destroys the healthy action of the nerve itself; hence it is a feature of catarrhal diseases of the nose and of tumors of the nose; but the loss of smell is only partial, unless the nasal membrane is very extensively involved in the catarrh; or, on the other hand, the nasal passage is entirely closed by the tumors. If the disease is in the nerves, it is due to some cause existing in the brain or in the nerves leading from the brain to the nose; in a majority of cases this is caused by blows or injuries, and comes on suddenly.

Treatment.—If it is due to disease of the nasal cavity, that should of course be remedied. If it is due to nerve or brain disease, the method of treatment which gives the best promise of relief is electricity, administered by a competent physician.

Glanders.

This is one of the most fatal of the diseases of its class, and depends for its cause upon inoculation with the poison of glanders or farcy from a diseased horse or mule.

It is mentioned in this connection on account of the profuse, purulent, viscid, and bloody discharge which takes place from the nostrils, and which is one of the most prominent features of the disease. Later, gangrene of the parts about the nose occurs, and is rapidly followed by death. More extended mention of glanders will be found among the "Acute Infectious Diseases."

Influenza.

This properly is the name given to a disease which has prevailed at times in this country and in Europe as a severe and often extremely fatal epidemic, commencing in some one locality, spreading with great rapidity over a whole country and attacking large portions of the population. The epidemic of 1782, in Europe, is said to have attacked one-half the population. The lower animals as well man are subject to it.

The symptoms are those of a severe cold in the head, with the addition that it is attended by a very high fever, and a degree of prostration rarely met with in connection with that disease. It may properly be considered, therefore, a disease of the general system, and is due, probably, to germs which, floating in the atmosphere, reach the mucous membrane of the nose, and give rise to the catarrhal symptoms, and, being absorbed into the blood, cause the marked constitutional symptoms above mentioned. Unlike the eruptive fevers, the same person is liable to repeated attacks, though not in the same season, and it is not contagious.

Treatment.—The disease runs its course in from six to ten days, and cannot be cut short, or aborted, like a cold in the head. Much relief may be obtained by the use of the same local remedies as are efficient in acute catarrh, and, in addition to this, general tonics with nutritive food, and a moderate amount of alcoholic stimulant should be given. [See, also, page 58.]

Restoration of Nose.

As the result of syphilis, scrofula, cancer, or violence, the nose is sometimes destroyed or lost, and the sufferer seeks relief at the hands of a surgeon from the terrible deformity which the

loss causes. The operation consists in transferring a piece of the skin, cut in such a shape that it will fill up the part wanting in the nose, from either the arm or the forehead. The new organ being sewed in its place, but still connected by a broad attachment to the part from which it was taken, the attachment is cut only after the piece has grown into its new locality, which generally requires about ten days.

If the arm is used, the piece is cut from the inside of the forearm, and the hand is bound to the head while the parts grow to-

FIG. 112.

FIG. 113.

FIGURE 112.—Depressed nose.
FIGURE 113.—New nose made from skin taken from the forehead.

gether. If the new organ is taken from the forehead, as is usually done now, the piece is simply cut out, twisted down on the nose, and stitched into place, and its attachment is cut at the end of about ten days; the wound of the forehead heals readily, and leaves but a small scar. The operation is attended with no danger, but the result is not very flattering, the new nose being a rather shapeless affair as compared with the one formed by nature.

Deformities of the Nose.

Owing to the results of injuries or to natural deformity, the nose is sometimes turned to one side, or has a projecting portion which renders it unsightly. This is capable, in some instances, of being much relieved by the use of an apparatus to be worn at night and other convenient times, by which pressure is made by pads and springs upon the projecting part. The success of this treatment is in proportion to the youth of the patient and the recent nature of the deformity.

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The Throat and its Diseases.

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THE THROAT

THE THROAT is a double passage-way through which the air we breathe reaches the larynx on its way to the lungs, and through which the food we swallow reaches the gullet on its way to the stomach. It is therefore a very important portion of the body, being employed in the two functions of respiration and alimentation (feeding), the former being the more essential of the two.

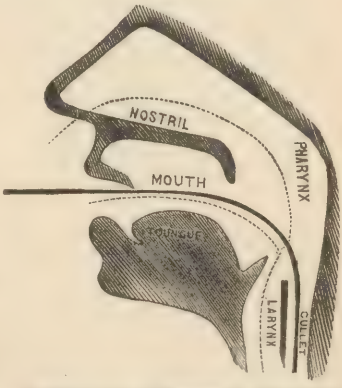


FIGURE 114.—Diagram of the routes taken by the air to reach the lungs, and by the food to reach the stomach.

As shown in the adjoining diagram, it will be seen that there are two routes by which the air is conveyed to the larynx : 1, *The normal respiratory route* through the nostril, as indicated by the upper dotted line in the diagram; and 2, *The accessory respiratory route* through the mouth, as indicated by the lower dotted line. The route taken by food and drink, *the alimentary route*, is indicated in the diagram by the solid line passing through the mouth, beyond the larynx, into the gullet (food-pipe, œsophagus) behind. The larynx is composed of rigid structures which keep its calibre open for the necessary ingress and egress of the air in respiration; while the gullet is a soft tube, composed of flexible structures, the walls of which are in close juxtaposition, except when forced open by the muscular act or effort of swallowing to receive the food or drink. As the food-pipe is behind the air-pipe, articles of food or drink might easily fall into the larynx by accident, were it not for a cover or valve at the top of the front part of the larynx, which is pressed right down upon it, like a trap-door over a hole or the lid on a molasses-jug, in the motion of swallowing, during the momentary

performance of which act respiration is necessarily suspended. If one talks or laughs while swallowing, the trap-door may remain open and some food or drink may get down the wrong way and enter the larynx, provoking spasmodic efforts of cough to expel it —an occurrence with which almost every one is familiar.

FIGURE 115.—The soft palate and tonsils, as seen from the mouth.

The nostril is the proper passage for respiration, but when stopped up by mucus, a swelling, a morbid growth, or a foreign body, the *accessory respiratory route* (the mouth) must be used for this purpose; and in fact it will be found that in most instances where people breathe by the mouth, there is more or less obstruction of some kind in the nose.

That portion of the throat in which the respiratory and alimentary tracts cross, is known as the *pharynx*, and it extends from the base of the skull behind the nostrils (see diagram) as far down as the entrance into the gullet, with which it is continuous. It is therefore somewhat the shape of the top of a buggy-wagon or a barouche. [For an account of the anatomy of the parts concerned, the reader is referred to the chapter on Anatomy.]

CARE OF THE THROAT.

Many individuals are very subject to diseases of the throat and nasal passages; a slight exposure to wet, change of temperature, change of clothing, change of bed-room, or the like, rendering them susceptible to sore throat, quinsy, cold in the head or chest, or whatever may be the special affection to which they are liable. It is useless to attempt to avoid this by taking medicine. Much may be done, however, to secure immunity from attacks of the kind on slight provocation, by methodically inuring the body to withstand the unavoidable exposures to which every active person is more or less subject in our variable climate. This is not to be done by the use of chest protectors, mufflers, heavy overclothing, furs, and like wraps. Far from it. The habitual use of these

things only serves to confirm the delicacy of constitution which they are fondly believed to protect; and when they are left off, or by accident or inadvertence forgotten, a severe attack of the complaint to which the individual is predisposed is almost certain to be the penalty. The causes of the predisposition alluded to are various. Sometimes the infirmity is hereditary. People are physically very much what their parents make them. Delicate or ailing parents are likely to breed delicate and unhealthy children. Hence the great number of deaths during childhood—weedings out, as it were, of the immature. Daily sponging of the body with cold water, on rising, is the best method of inuring the skin to withstand accidental exposure to wet and changes of temperature.

Among the exciting causes of diseases of the throat and nasal passages may be mentioned: Sudden exposures to excessive changes of temperature out of doors and indoors, especially exposure to cold when the body is overheated, no matter how the overheating may have been produced; sitting, working, and sleeping in illy-ventilated apartments; sojourn in crowded places, whether church, school-room, theatre, court-room, ball-room, or street-car; exposure to air vitiated by illuminating gas, coal gas, tobacco-smoke, the products of chemical combustion, and the like; the indulgence in cold drinks on the top of hot viands; immoderate use of iced water in summer time, especially when the body is overheated by exercise; too protracted contiguity to patients with scarlet fever and diphtheria.

It is much more rational to prevent disease than to trust to getting cured after contracting it. Persons subject to sore throat, whether hereditarily predisposed thereto or otherwise, should avoid all the sources of injury above enumerated. They should wear woollen or silken (*animal fabrics*) underclothing, changing the weight or texture of the garment on the positive approach of change of season.

When going from a warm and especially from a crowded room into a chilly outside atmosphere, the precaution to breathe for the first few minutes through the nose only, or through the meshes of a shawl, handkerchief, or folded veil, is all that will ordinarily be needed.

Where children are accustomed to breathe through the open mouth, this should lead to an examination, and it will probably be found that enlarged tonsils are the cause of the difficulty, and that they require removal by some of the methods to be hereafter detailed. The harm which results from breathing through the mouth, instead of the natural respiratory passage, is that the throat is rendered dry and apt to become inflamed; that the air is not prop-

erly warmed and moistened by passing over the wet and warm surfaces of the bones of the nose before it reaches the delicate vocal organ, and that dust and irritating matter, which *should* be arrested in its passage through the nose, is carried into the respiratory organs, and becomes a cause of disease.

[In England, more commonly than in this country, it is customary to wear a respirator made of some sort of gauze, or sponge over the nose and mouth; but the instances in which such protection is needed are far less than would justify the extent of the practice, if we except those connected with some of the trades. Indeed, among workmen who *could* derive decided benefit from the use of some such means for excluding foreign matter from the throat and air-passages, the use of respirators is much too seldom resorted to.]

The Voice.

A short account of the nature of the voice and its production, will insure a better comprehension of the method of taking care of it.

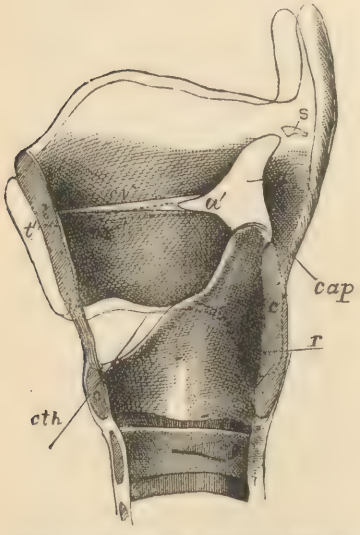


Figure 116.—Section through the cartilages of the larynx, showing the inner surface of the right side. *l*, thyroid cartilage cut through its centre, in front; *c*, *c*, front and rear portion of the cricoid cartilage, similarly divided; *a*, inner surface of the right arytenoid cartilage; *a'*, its anterior projection; *cv*, thyro-arytenoid ligament.

The *voice* is the sound voluntarily made in the throat for the usual purposes of communication and intercommunication; and it is broken up in an arbitrary manner, different as adopted by different nations or communities, by the physical action of the lips, tongue, teeth, and palate, into accentuated or articulated speech; while the modulation of the pitch and volume of the sounds gives expression to the utterances. The voice is formed in the larynx (vocal-box) (Fig. 116), on top of the windpipe, by the forcible action of an outward or expiratory current of air striking or impinging upon two tense bands or folds of membrane (vocal cords *cr*) which run from front to back in this box, in close contact in front, and movable behind *a'*, their to-and-fro movement being similar to that of the handles of a pair of scissors. These vocal cords are set into vibration just as the reeds of an accordion are set into

vibration by the wind from the bellows of that instrument. The hard, angular projection in the anterior part of the neck *t*, more prominent in men than in women, marks the junction of the two sides of this triangular vocal-box or larynx. If the finger is run down this projection, a soft depression *cth* is felt just before it joins a circular base (*cricoid* or ring-cartilage *c*), which is situated directly on top of the windpipe, of which it is actually an expanded continuation. If the finger be held against the soft part just indicated while the voice is sounded, the vibrations can be distinctly felt, because a thin membrane is there which is actually continuous with the vocal cords, which are located a little above it in the shape of a rather horizontal V, the legs of which are directed backward. The production of voice is due to the vibration of these cords, and to the vibration of the air in the air-tubes, throat, nose, and mouth, as can readily be felt in the chest when one speaks in a deep-toned voice ; and even the trunk and limbs vibrate just like the sounding-boards or walls of musical instruments in certain deep and sonorous tones.

The *intensity* or loudness of the voice is due to the size of the vibrations, or, in other words, to the extent of to-and-fro movement impressed upon the vocal cords ; the larger the space through which they vibrate, the greater is the quantity of air set in motion, the larger the wave of sound, and the louder the voice ; while the voice becomes more feeble as the space through which the vocal cords move becomes diminished. Intensity is independent of pitch and quality.

The *pitch* of the voice (its position in the musical scale) is proportionate to the frequency of the vibrations ; the greater the number per second, the higher the pitch. Pitch is independent of intensity and quality.

The *quality* of the voice (that characteristic which distinguishes it from the sound of an artificial musical instrument, and which makes it easy to recognize the voice of any one individual as different from all others) is due to the shape impressed upon the sound-waves by the consentaneous action of the different factors of the sound (fundamental tones, harmonic and unharmonic overtones, combination tones), owing to the fact that all musical sounds are composed of series of tones, most of which are produced by vibrations of the sounding body (vocal cords in man and animals) in certain aliquot parts, at the same time that it is vibrating as a whole. The more harmonious these individual tones, the sweeter the sound as a whole ; the more discordant these individual tones, the harsher the sound of the voice as a whole. The comprehension of this physical fact is rather difficult,

and would require a good deal of space for its elucidation. The reader is therefore referred for details to works on physics, on acoustics, or on sound. Quality is independent of intensity and pitch.

To understand the physical formation of the registers of the voice, it is necessary to see the performance. This can be accomplished by placing a small mirror in the mouth in such a position as to get a reflected view of the image of the vocal-box (larynx) and its contents, as shown in this figure below, in which the image of

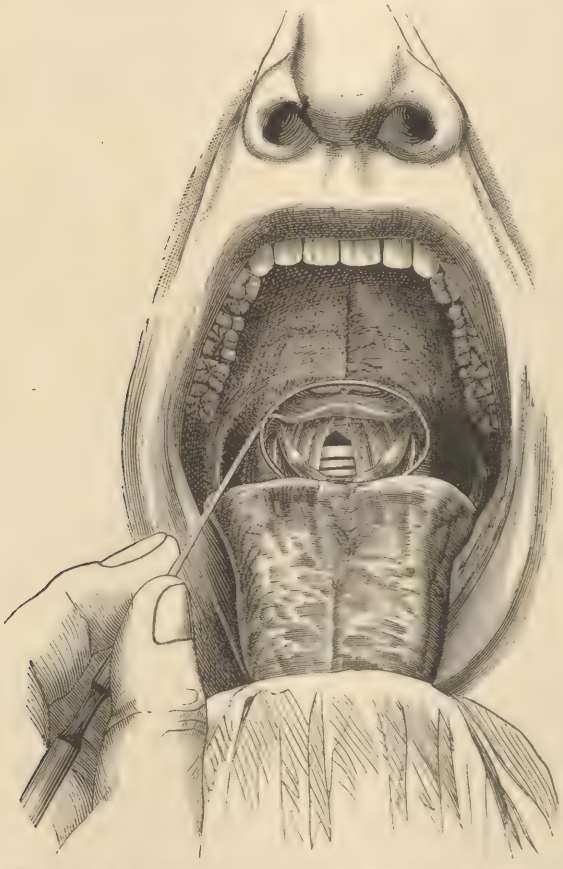


FIGURE 117.—The larynx in the respiratory position, as seen in an image reflected in a glass mirror held far back in the mouth.

the larynx is seen as reflected in a mirror in the mouth. This ingenious and beautiful method of exhibiting the larynx of a living person and studying the action of the vocal cords in the formation of voice is known as the art of laryngoscopy (viewing the

larynx), and the demonstration of its feasibility is chiefly due to the assiduous efforts of Mr. Manuel Garcia, a celebrated teacher of vocal music in London, who devised it for the purpose of studying the mechanism of the voice. Since the publication of Garcia's observations, the method has been extensively introduced into the practice of medicine in the examination and treatment of many affections of the throat.

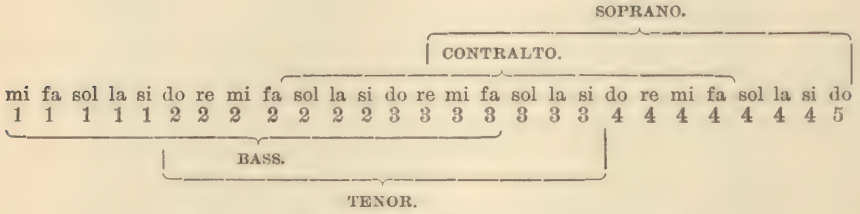
As depicted in the above illustration, the vocal cords are repre-

FIGURE 118.—Method of examining the larynx by solar reflection.

sented widely separated behind, as seen during a deep inspiration, which renders the rings of the windpipe visible below them. When the voice is produced, the vocal cords have to come together posteriorly, as shown in Fig. 119, leaving a delicate slit between them, through which the expiratory current of air is forced, setting the cords into vibration; an effect which is readily observed in the mirror. Of course the rings of the windpipe and all the other structures below the vocal cords are shut off from view as long as the voice is being sounded. When the pitch of the voice is raised, the vocal cords are seen to become more tightly stretched, and the slit between them to become shorter, so as to leave a shorter and more tense portion of the cord free to vibrate; the pitch rising just the same as when the cord of any stringed instrument of music is shortened, and stretched more tightly.

FIGURE 119.—Vocal cords closed, as seen in the production of vocal sound.

There are three principal *registers* of the voice : chest, falsetto, and head-notes. In the formation of the *chest-notes*, the vocal cords are seen to vibrate their entire breadth. In the formation of the *falsetto-notes*, the vibration is confined to their edges. In the formation of the *head-notes* (common to women, exceptional in men), the vocal cords become so tightly pressed together behind, that there only remains an open slit or fissure for little more than half the length of the vocal cords, which vibrate only in their free edges.*



The usual range of the four varieties of the human voice.

Care of the Voice.

When we consider that the entire compass of the voice is due to the symmetrical action of two vocal cords, little bands of tissue, as thin at their edges as a sheet of ordinary writing-paper, less than an inch in length, about one-tenth of an inch in breadth, and with but one free surface each, we can readily comprehend how delicate must be the mechanism and arrangement of the nervous and muscular structures that animate them and alter their position and tension in order to produce those charming effects with which all listeners to good vocal music and good oratory are familiar. It is no wonder, then, that good voices are so often irretrievably injured by injudicious management. No teacher of elocution or of vocal music should be trusted now-a-days with the training of a voice of some consequence to its possessor, unless that teacher has a comprehensive acquaintance with the anatomy, physiology, and mechanism of the voice. As already mentioned, the special mechanism of the sounds of the chest, falsetto, and head registers are dissimilar. If, then, an ambitious teacher tries to force the chest tones into the falsetto register, or the falsetto into the head register, he is apt to inflict injury upon the delicate mechanism, whether he accomplishes his object or not. The proper points of transition can be observed in the mirror, and can be detected by an educated

* For more detail, the reader is referred to Mrs. Seiler's reliable work on "The Voice in Singing," published in Philadelphia.

ear, so that there is no excuse for neglecting their study. Surely no master, with a real love for his art, should hesitate to avail himself of the advantages to be gained by such observations. The manual skill necessary for the manipulation of the throat or laryngoscopic mirror can be acquired in an hour ; the cost of the mirror is about one dollar. The anatomy of the parts, once carefully pointed out in a human larynx, can be thoroughly studied up at leisure in calves' larynges (which can be had from any butcher for the asking), and the rest is a question of time and facility of comprehension. The result of the outlay, in intelligent knowledge of the tools with which he is to work, will be immeasurably in excess of its cost to any teacher of vocal culture, not to count its personal advantages in improving his own skill in the use of his voice, or in developing the vocal capabilities of his pupils. Anything which strains the vocal cords, such as screaming, prolonged use of the voice, talking or singing in too high a key, using the voice to any extent when fatigued, overfed, unwell, or hoarse, is sure to be injurious, and should be studiously avoided by all public singers and speakers. It is neglect of care of this kind which drives so many from the stage, concert-room, and pulpit during a prolonged period of inaction ; and it is rare that an injured voice recovers all its previous tractability. All those injurious influences enumerated in connection with the subject of care of the throat are injurious to the voice. A slight congestion of the cords, from cold or overstraining, is sufficient to withdraw them from the exquisite control of muscular effort so essential to the formation of pure tones ; and the swelling of inflammation changes their physical capacity for tone still more so, and, in addition, sometimes prevents their being brought sufficiently near each other to produce any tone at all, so that the voice is lost, for the time being, unless under the force of violent effort, in itself injurious. One should, therefore, cease speaking in public, or singing anywhere, the moment there is any manifestation of hoarseness, however slight. There is no compromise possible, if the individual is not to run the risk of more or less prolonged hoarseness, or trouble more serious. Indeed, preachers and professional and domestic vocalists should speak altogether in whispers whenever their voices are hoarse ; and those who do not sing or lecture, and to whom alteration of the voice is but of little moment, should use the voice as little as practicable whenever it is affected. Silence, ice to the throat, externally and internally, a smart saline or castor-oil purge, and the avoidance, for a few days, of red meat and alcoholic beverages of all kinds, will, in most instances of slight recent injury to the voice, suffice for treatment. In cases of severe injury, and in

cases of long standing the advice of the physician is essential. Silence in cases of affected voice is more than golden to the individual who is dependent on skill in its use for support.

DISEASES OF THE THROAT.

Sore Throat.

Sore throat may be confined either to the parts back of the mouth (palate, tonsils, pharynx), or the deeper portions (larynx, windpipe), or it may affect all these structures more or less. Sore throat is a frequent accompaniment of scarlet fever, measles, small-pox, erysipelas of the face, and other affections. It is one of the prominent manifestations in diphtheria. It is also an accompaniment of many cases of pulmonary consumption, especially toward their final stages; and is a very frequent manifestation in the constitutional ravages of syphilis, after the system has become impregnated with the virus. It may be brought on by voluntary or accidental swallowing of hot and corrosive fluids; by exposure to respiration of noxious gases and fumes; by the inhalation of dust, smoke, grit, and the like; by loud and continuous talking and overstraining the voice in various ways; by the abuse of tobacco, alcoholic beverages, highly seasoned food, or of hot and cold viands in close succession.

The most frequent cause of sore throat is exposure to cold when the body is overheated.

The Symptoms of sore throat are pain, redness, swelling, difficulty of breathing, difficulty of swallowing, cough, expectoration, hoarseness, and impairment or loss of voice. The intensity of the symptoms vary with the amount of inflammation, the extent of surface over which it extends, the nature of the tissue in which the diseased process is going on, and the mechanical interference with the functions of breathing, swallowing, and speaking. Some cases are so slight as hardly to attract attention, and others are more severe, so as to interfere with the due performance of one's duties.

Treatment.—Most cases will get well if they are only left alone without resort to any of the numerous advertised syrups, lozenges, and other remedies. All that needs to be done is to remain quiet, avoid conversation, to see that the body is well protected by proper clothing day and night, avoiding exposure to cold and wet; to suck bits of ice almost continually if the throat is hot, swollen, and painful, and to apply iced cloths or bags of pounded ice exter-

nally, changing them as soon as they get warm, and to eat very plainly cooked food, and very little of it. If the bowels have been confined, a smart purging will be useful, and nothing is better than a dose of Epsom salt (a tablespoonful for the adult, in a tumbler of water, before breakfast) in summer, or of an infusion of senna (one or two drachms for the adult) and manna (one ounce for an adult) in winter. If the sore throat is not of more than twenty-four hours' standing, it is a good plan to put the legs into hot water well impregnated with mustard, until they get very red, take something in the nature of a hot drink, and then jump right into bed between blankets, and remain there until late the following morning. This treatment will often cure a mild sore throat in two or three days ; and neglect of it will often convert a mild and easily managed case into a protracted and obstinate one. If the treatment here laid down is not promptly followed by amelioration of the symptoms, it may be taken for granted that the case is beyond the ordinary resources of home remedies, and the sooner the medical attendant is summoned the more quickly will the patient get relief and be placed on the road to recovery. Meanwhile, the sufferer may suck a sal-prunell ball, and cover the neck with a flannel wrung out of heated camphor-water, or a mixture of oil of turpentine with three times as much sweet-oil.

Severe sore throats should always be reported promptly to the physician. Delay of only a few hours often renders it impossible to institute measures to restrain inflammatory action, and the disease will have to run its course. The neglect of proper management is almost sure to be punished by chronic or protracted suffering. A brief description will be given of the severer forms of sore throat, in order that they may be promptly recognized, and such measures advised as are judicious to be employed until the arrival of the medical attendant. Any one ignorant of medical subjects and of the natural history of disease who meddles with powerful drugs is much more likely to do irreparable injury than temporary good. It is almost always "hit or miss," and the misses inevitably preponderate ; not unfrequently they are the immediate precursors of fatal results.

Enlarged Tonsils.

[The tonsils consist of two rounded or ovoid bodies the size of a cherry, and are made up of connective tissue, holding together a number of glands which secrete a thick, glairy mucus, and have a number of openings upon the surface of the tonsil. They are situated on the sides of the throat between the folds of the palate.

(See Fig. 120.) They are often swollen in children and young persons, as a result, so it is thought, of a scrofulous constitution, and quite frequently on account of repeated attacks of sore throat.]

A slight enlargement of the tonsils produces no unpleasant symptoms ; but when they are large enough to project some considerable distance into the free passage of the throat, they interfere with swallowing and sometimes with respiration. They push the soft palate away from the back part of the throat and produce a nasal twang of the voice, with the addition of a peculiar tone due to interference with proper articulation. Sometimes they are large enough to touch each other, and they then prevent a proper amount of air from entering the lungs, and compel the patient to maintain a certain position of the neck, which renders him what is called "round-shouldered." When very large they have been known to produce suffocation. The liability of chronically enlarged tonsils to become inflamed is quite great, and such attacks are usually severe. Sometimes they become ulcerated. Sometimes the glands secrete a mucus, which cannot escape freely from the little orifices, and it undergoes a transformation into a cheesy material of very fetid character. These little masses are often spat out from time to time, and when crushed emit a very offensive odor.

Treatment.—The treatment of enlarged tonsils usually demands the use of nutritious diet and often that of cod-liver oil to improve the general health. The best home treatment, when they are soft, is the application of ox-gall, either fresh or partly dried by evaporation, twice or thrice daily; the application being made by a finger of one hand while the fingers of the other hand support the neck outside so as to press the tonsil in both directions. Simple compression of this kind, without any local medication, applied several times a day, will sometimes promote the absorption of these bodies if the enlargement is soft and of recent standing. Gargles of water containing chlorate of potassium, alum, white-oak bark, or rhatany, are sometimes useful, and so is the local use of sprays, as recommended for chronic sore throat. [For the proportions of these, see the formulas at the end of the second volume.] If the increase in size is very great (and these simple measures are not of any service after a few weeks' trial), the services of a surgeon will become necessary to cut off a portion of the gland or reduce its size by the application of strong caustics.

[*Pigeon breast* is also a result of considerably enlarged tonsils. When the diaphragm contracts during inspiration and the floor of the thorax is pulled downward, a vacuum tends to be made in the chest cavity, air rushes in to fill it from without, and the vacuum is prevented. If air is not admitted as rapidly as the vacuum de-

mands, the weight of atmospheric pressure on the flexible walls of the chest causes the ribs and cartilages to bend inward and assume the appearance characteristic of this deformity. Furthermore, the development of the chest is interfered with, and the lungs, especially about their upper portions, never acquire the capacity essential to health: and as the period during which development can take place is limited to youth, the person who has been allowed to suffer in the manner described remains deformed for life, and is especially liable, it is thought, to the development of consumption.

Inflammation of the Tonsil—Quinsy Sore Throat.

This is almost entirely a disease of temperate and changeable climates, is most common among persons between sixteen and thirty years of age, and is only rarely seen among children. It consists of an inflammation of the mucous membrane covering the tonsil or of the deeper portion of the glands, and either one or both tonsils may be affected, although it is more common that one alone is inflamed at a time. Persons who have a tendency to suffer from rheumatism are thought to be especially liable to this trouble. The most frequent exciting cause (where one can be recognized) is exposure to wet and cold, particularly during a north-east wind (in the Atlantic States). When atmospheric causes exist there will usually be a number of cases in the same community.

Symptoms.—A chill usually occurs at the outset, followed by considerable fever, which is accompanied by aching of the muscles generally, "as if they had been pounded." There is headache and a pain in the throat on the side affected, and the pain will very probably be increased by movements of the jaw and efforts to swallow. On looking at the tonsil, it is seen to be red and swollen. As the disease progresses, the swelling and pain increase, until swallowing becomes difficult or almost impossible; while, to aggravate the trouble, the saliva is increased in quantity, and, rather than subject himself to the torture of swallowing, it is allowed by the patient to run from the mouth. In a well-marked case of quinsy the breath acquires a peculiar odor, quickly recognized when once smelled, and the voice becomes thick and muffled, so that the words can hardly be understood.]

The swelling may be so great as to prevent closure of the mouth, on the one hand, and as to impede respiration, on the other, so that the patient, for the time being, is in a deplorable condition. In cases of moderate severity the symptoms gradually abate; but in severe cases they continue until an abscess is formed, and when that is discharged spontaneously, or by the surgeon's knife, the

severity of the symptoms cease almost instantly, and complete recovery ensues in a few days.

Treatment.—There is some danger in allowing an abscess in the tonsil to open of itself, as the pus may fall into the larynx, and produce suffocation. In all cases, therefore, where the tonsil is inflamed, medical aid should be promptly solicited. Meanwhile ice or iced water externally and internally, a purging enema of salt and water, and rest in the recumbent posture, may be instituted at home until the arrival of the physician.

FIGURE 120.—Enlarged tonsils and elongated uvula.

[The inhalation of vapor from hot water will often give temporary relief to some of the symptoms.

The patient must not attempt to swallow solid food, but should take as freely as the pain of swallowing will permit, ice-cream, soups, gruels, iced milk, custard, etc. The prescription of stimulants had better be left to a physician. The use of guaiacum in doses of two grains of the powder, repeated every hour, will sometimes put an end to an attack in its earliest stages.]

Diphtheria.

Diphtheria is a form of blood-poisoning, of which inflammation of the throat is but one symptom. It is often fatal; occurs at all seasons; is often common in certain localities where there is excessive ground-moisture from bad drainage; and attacks individuals of any age.

It is due to a peculiar poisoning of the blood, the exact nature of which is unknown, but which is believed to be in great measure connected with poisonous emanations from defective sewerage. Young children who have been weaned from the breast are quite liable to it up to the age of ten or eleven years; after which the susceptibility declines, though it is never lost entirely. The chief manifestation, apart from general symptoms of sore throat, with a state of low fever, is the appearance of a peculiar membrane on some part of the throat, usually commencing on the tonsils, which in some cases may eventually cover the entire throat, the walls of

the nasal passages, the larynx, wind-pipe, and bronchial tubes, and even other mucous membranes, as well as abraded portions of the skin. When the air-passages become involved, there is an additional danger from suffocation; but though many cases die from this cause, the greater number die exhausted by the debilitating effects of the poison. There is a mild form of sore throat, not accompanied by low febrile symptoms, in which there also appears an exudation upon the throat. This is apt to be mistaken for diphtheria, but differs from it in there being no tendency to death from blood-poisoning. It is often very difficult for even a physician to discriminate between the two affections at the outset; and hence the occurrence of sore throat with any evidence of a whitish or yellowish patch or streak about the tonsils or palate should always occasion sufficient alarm to send for medical advice at once, for if a mistake is made it may be fatal, inasmuch as severe cases of diphtheria are not likely to recover unless judiciously managed from the start. If there be languor, fever, sore throat, and patches in the throat, especially if there is swelling of the glands under the jaw on the side affected, it is quite likely that the case is diphtheria.

Treatment.—A case of diphtheria should be isolated as far as practicable from every one but the necessary attendants, and no stuffed furniture or drapery should be permitted in the sick-room; for the disease is contagious, and the infecting matter is very apt to adhere to upholstery, carpets, and the like. The best thing to be done pending the advice of a physician, is to place the patient in a room of not less than 70° temperature, avoiding draughts, while securing free ventilation; and to encourage the patient to keep bits of ice in the mouth; to place cloths wrung out of iced water around the throat, and replace them every two or three minutes as they get warm, and to keep up a plentiful supply of good, strong soup, milk punch, and as liberal an allowance of well-cooked animal food as can be taken without disgust. There need be no hesitation in giving brandy, whiskey, or rum, in small quantities, quite frequently, even every hour if the patient is getting weak, so long as there are no signs of approaching intoxication. If there are any such signs of its intoxicating influence, it is evidence that too much liquor is being given. It is useless to mention here any remedies to be used. In a malady so serious as diphtheria remedies are unsafe in unskilful hands. There is no remedy that will cure the disease, but such means will be used by the physician as will best keep up the patient's strength, promote his appetite, soothe his sufferings, and detach the membrane from the air-passages when they become involved. If the physician's services cannot be promptly secured,

it is usually safe to administer chlorate of potassium (two grains to a child about one year of age, five grains to one of twelve, and ten to an adult) and tincture of the chloride of iron (five drops to a child of a year or two, ten drops to one over twelve, and twenty to an adult) in sweetened water made palatable by lemon-juice or lemon-syrup, every two or three hours. In bad cases, sleep should be disturbed to give the medicine. Sometimes the membranes in the air-passages threaten eventual destruction by suffocation, and it becomes necessary, as in croup, to avert this danger by making an artificial opening into the windpipe through which the patient can breathe; and if the deposits be not too extensive below this opening, it gives the patient a good chance to live longer, so that, if his strength and vitality are sufficient, he may pass through the remaining stages of the disease and recover; but the operation is not in itself curative. Active measures are still requisite, and extra attention is essential to take care that the artificial opening does not get clogged up with mucus or false membrane, and thus make matters worse than before. Sometimes the matters expectorated accumulate in the mouth in dangerous quantity, and require to be removed by the fingers or the mop. This operation, often effective in children between two and twelve years of age (in whom the small size of the windpipe admits of less swelling of the lining membrane than is the case with a grown person), is rarely of any avail in the adult.

Relaxation of the Palate—Elongated Uvula.

This is a frequent ailment in persons subject to sore throat, the chief symptom being a frequent cough from titillation of the tongue, or of the valve on top of the larynx, by the tip of the uvula, especially while lying down. Many cases of chronic cough are due to this cause. (See Fig. 120.)

The Treatment consists in cutting off a portion of the elongated uvula, and thus removing the source of the evil. Slight cases and ordinary relaxation of the palate can sometimes be cured by the frequent use of pellets of ice in the mouth, or by sucking alum, catechu, or borax. A long tapering uvula can rarely be relieved without an operation.

Chronic Pharyngitis; Clergymen's Sore Throat; Chronic Sore Throat.

Clergymen are by no means the only individuals affected with chronic pharyngitis; public speakers generally, teachers, actors,

newsboys, salespeople—in fact, all persons who are compelled to use the voice a good deal in all weathers, are extremely liable to the affection. Chronic pharyngitis is characterized by increased redness of the various structures of the throat,—enlarged blood-vessels being visible on various portions of the surface, with a rough or raw appearance of the parts, and little groups of elevations here and there, due to enlargement of the glands which secrete the mucus that keeps the throat moist, pliable, and comfortable. There is more or less accumulation of viscid mucus, which is prone to adhere in strands or clumps to the raw surface.

The Symptoms are chiefly those of annoying sensations of discomfort in the throat, with more or less hawking to free the throat from mucus. Sometimes, however, there is considerable pain and heat in the throat, and often more or less hoarseness from extension of the disease into the larynx. (See Chronic Laryngitis.) There

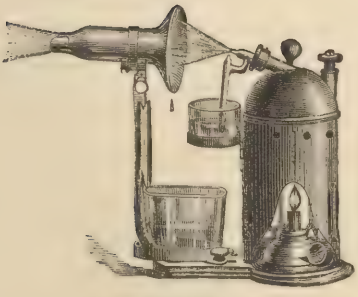


Fig. 121.

Fig. 122.

Figure 121.—Apparatus for making a spray by means of steam-pressure. (Codman & Shurtleff's apparatus.)
Figure 122.—Apparatus for making a spray by means of air-pressure.

is a good deal of apprehension on the part of the public that the disease in the throat may extend to the lungs and eventuate in consumption; but this does not take place unless the individual is predisposed to consumption, or acquires a disposition to it. When there is a predisposition to consumption, however, it is quite likely that it may be accelerated by this chronic sore throat.

Treatment.—The disease is a chronic one, usually of long standing before it attracts much attention; and it is therefore one which requires a good deal of time in its treatment. The habitual use of weak gargles of alum, borax, and chlorate of

potash (five to ten grains to the ounce of water), is advisable; and it is well to use these solutions in the form of spray by means of the so-called atomizer (Figs. 121 and 122), which breaks the fluid up into a minute spray, and at the same time propels it with considerable force so that the remedy reaches a great many parts that cannot be reached by gargling. A careful attention to easily digested diet is also of great importance; while the bowels, kidneys, and skin should be kept in as healthy a condition as possible. If this simple treatment does not suffice, the aid of the physician must be invoked to make local applications of tincture of iodine, nitrate of silver, or other remedies. There is a great deal of prejudice against the use of nitrate of silver, which is far the best agent in most cases; and this arises from the idea that it is to be used as a *caustic* to burn something away. This is not so. An application of nitrate of silver leaves an impermeable white coating on the parts, which protects them temporarily from the air and from impure saliva, and thus gives the parts beneath the coating a chance to get well. This is the whole secret. The application must be thoroughly made by a competent person, and need not be repeated until the coating falls off, which usually takes place in from one to three days. Two or three thorough applications a week, with a strong solution, or even with the solid nitrate of silver, will be much more effectual than daily pencillings with a weak solution. These applications should never be made by unskilful hands, or they will do harm instead of good. Hence no directions are given as to the strength of the solution and the manner of application.

Internal remedies are incompetent to cure the disease, no matter how skilfully selected; but they are almost always required to correct some defect of nutrition, the continuance of which retards the cure; and these remedies vary, of course, with each individual case.

Public speakers must use the voice as little as possible during the treatment, and the use of tobacco and alcoholic beverages should be given up. It is not necessary to observe that absolute disuse of voice so essential to prompt recovery in inflammatory affections of the larynx itself, in which the vocal cords participate directly in the diseased process.

Acute Laryngitis—Inflammation of the Larynx.

This is an acute inflammation of the mucous membrane of the larynx, from cold or from local injury. It sometimes occurs in patients affected with typhoid fever, small-pox, and other diseases; it occurs from swallowing and inhaling hot or acrid substances;

but in the great majority of cases it is the result of abrupt exposure to excessive changes of temperature. The symptoms, though severe, are not threatening, and the inflammation is superficial. Still there is a liability to the sudden, or more or less prompt effusion of serum (fluid part of the blood) beneath the mucous membrane of certain portions of the larynx, producing a dropsy of the part, which may seriously interfere with respiration and even produce suffocation if not promptly relieved by the knife of the surgeon,—for medicines are of no avail in this critical condition. Whenever, therefore, in the course of a sore throat, any serious impediment to respiration takes place suddenly, or during the course of a few hours, a physician should be promptly summoned, or a fatal disaster, that could otherwise have been averted, may ensue from neglecting to do so.

The Symptoms of laryngitis are pain in the deeper portion of the throat (often increased on pressure externally), hoarseness, brassy cough, difficulty or pain in swallowing, and some impediment to respiration.

The Treatment consists in maintaining absolute rest in the recumbent posture, disuse of the voice, unloading of the bowels by a dose of Epsom salt (one ounce for an adult) or other saline, and keeping them in a soluble condition, and the local use of ice externally and in the mouth. The diet should be fluid and mucilaginous, so as to be swallowed with the greatest ease, and acid drinks may be allowed if they do not hurt the parts. If the patient goes about his usual pursuits, he is liable to a serious and sudden increase of the inflammation, which may lead to suffocation before he can get medical assistance, and the danger of this complication exists in almost every case. An amount of inflammation which would be insignificant in any external part of the body, and devoid of immediate danger anywhere else, is a very serious affair in the narrow portion of the larynx, and apt to end in death by suffocation. Most cases of laryngitis, therefore, demand the assiduous attention of a physician. If there is much fever, a small dose of Epsom salt (one teaspoonful for an adult) and tartar-emetic (one-eighth of a grain for an adult), or antimonial wine (a few drops) in water, may be taken at intervals of eight, six, or four hours, according to the urgency of the symptoms.

Chronic Laryngitis—Chronic Inflammation of the Larynx.

This disease is often the result of a succession of more or less acute attacks. Sometimes it is an extension of chronic inflammation of the pharynx. (See page 392.)

Symptoms.—These are chiefly hoarseness, a brassy sort of cough, with or without a sense of pain deep down under the breast-bone, due, usually, to extension of the disease to the windpipe, and, finally expectoration. The structures affected cannot be examined without the laryngoscope (see Fig. 117, p. 382), and when thus examined reveal the usual signs of chronic inflammation, redness, swelling, more or less mucus in the parts, and sometimes superficial ulcerations. There are no deep ulcerations in simple chronic laryngitis; but in that form of the disease attendant upon tuberculous consumption there is certain to be ulceration, often with more or less destruction of various tissues, even including the cartilages. The same remark holds good with regard to the chronic laryngitis of syphilis, and some other blood diseases. Simple chronic laryngitis, properly managed, is a curable disease (though otherwise likely to continue for years uncured); so is the chronic laryngitis of syphilis, provided the destruction of tissue has not proceeded so far as to be mechanically incompatible with life; but the chronic laryngitis of tuberculous consumption is, in most instances, incurable, though, on the whole, consumptive patients with ulceration of the larynx are apt to live a year or two longer, on the average, than those in whom the disease does not involve this organ. From four to seven years may be said to be the average duration of life after the development of tuberculous inflammation in these cases.

The Treatment of chronic laryngitis demands attention to the general health, in the first instance. Scrofulous and consumptive individuals need cod-liver oil; syphilitic patients require anti-syphilitic treatment; those who are anæmic or pallid often (not always) require iron in some form, and so on, according to the defect or injury in the general condition. Local treatment by inhalation of medicated vapors, or sprays, or the application of fluid substances by means of brushes or swabs, is almost always indicated, and the

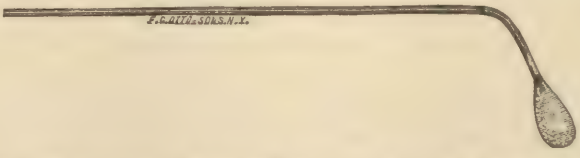


FIGURE 123.—Sponge attached to a curved whalebone, called a probang, used for applying medicated fluids to the throat.

choice of these must be left to the medical adviser, since much harm is done by the injudicious and promiscuous resort to these agents without competent advice. In severe cases, especially those of tuberculous ulceration, there is great difficulty in swallowing; each effort producing an amount of distress that appears incredi-

ble when detailed to those who have not witnessed it. The swallowing of a little sweet-oil, before each attempt at swallowing food, will often be of great service in such instances. Feeding by the bowel, for a few days, is often of great use in these cases, letting the throat rest from swallowing until it is better able to resume its functions.

Great difficulty of respiration exists in many cases, and sometimes threatens suffocation to such an extent as to demand an artificial opening into the windpipe. This operation, when timely performed, will often prolong life for months in tuberculous cases—occasionally for years. In syphilitic laryngitis this operation may really save the patient's life; for the disease itself is not at all necessarily fatal, as tuberculous disease is apt to be, and time will thereby be gained for the effect of remedies which improve the general condition of the system.

Croup—Membranous Laryngitis; Hives.

Croup is an inflammatory affection of the upper air-passages attended with the formation of a false membrane on the walls of the larynx and windpipe and even in the bronchial tubes, similar to that which is formed in diphtheria, with this difference: that there is no blood-poisoning in croup, and the main source of danger is from suffocation. Neither is there the debility in the earlier stages of croup that is present in diphtheria. The number of respirations keep their normal proportion to the beats of the pulse (about 1:4) for a long time, instead of soon losing in ratio, as is the case in diphtheria. The disease rarely attacks the adult, and is not contagious. The immediate exciting cause of croup in children is usually more or less sudden exposure to cold, as in taking a child from the bed to the window to see a procession, and so on. The vicious method in which silly parents keep their little children half-undressed, with neck and shoulders, and legs and knees, more or less exposed, is responsible for many deaths-a-cold by which the lives of their little ones are sacrificed at the shrine of vanity.

Symptoms.—Croup usually commences in a cold with the ordinary symptoms, but in a few days, sometimes in twenty-four hours, there is difficulty of breathing with more or less impairment of voice. Some cases of croup are attended by spasm of the air-passage, but not nearly so frequently as is generally supposed, many cases being entirely without it. The hoarseness usually attracts attention at night or toward morning, for the first time; and at the same time there is a harsh, brassy sounding cough

likened to the sound of a cock's crow. After a while the cough gets hoarse like the voice, and then, often, both become gradually muffled, so that they do not attract attention when the child is not watched. When the membrane is on the vocal cords, the voice and cough will hardly be audible. There is a shrill sound in drawing in the breath, and the hollow of the neck just above the breast-bone will be seen to become deeper at each inspiration. As the case gets worse, the soft parts below and between the ribs will also be seen to sink in during inspiration. These phenomena are mechanical altogether. Sufficient air to fill the lungs cannot be forced through the narrowed air-passages; and hence, as the ribs are raised by the action of the chest muscles, the atmospheric air outside presses the soft parts inward. When the air-passages are similarly implicated in diphtheria, the same mechanical phenomena take place from the same physical cause. Many cases of croup cannot be distinguished from diphtheria. Indeed, some physicians believe the two to be identical in character; while others (whose views seem most reliable in the writer's estimation) contend that there is no element of blood-poisoning in croup. To ward off the threatened suffocation, the same operation is often required as in diphtheria when the larynx and windpipe are involved; but the chances of success are infinitely better in croup, because there is no special blood-poisoning to counteract.

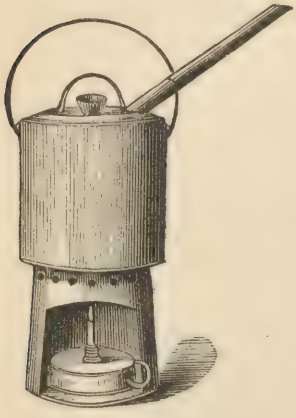


FIGURE 124.—Croup-kettle.*

When a child has the difficulty of breathing just described, an atmosphere of steam from boiling clothes in a boiler, or some other means, as a croup-kettle (Fig. 124), for instance, or some extemporaneous substitute for it, as it is rarely to be had when required, should be maintained near it, to keep the deposits moist and loose, so that they can be coughed out. Raising the clothes now and then out of the vessel diffuses an atmosphere of steam about, just as is seen in the laundry or kitchen. Slacking lime in the room near the patient is a good

* [In having this made by a tinsmith, the lamp should be provided with three or four wicks, instead of a single one, and the tube for conveying the steam should be longer, and made double, that is, with an outer tube somewhat larger than the inner one and so constructed that an air-space of about half an inch will intervene. This will serve as a non-conductor of heat and prevent the steam condensing to water before it reaches the interior of the crib. The funnel in the top is closed with an ordinary cork and admits of the introduction of hot water without disturbing the steam-pipe.]

method of getting up a vapor of steam; besides which there is a certain amount of mechanical benefit from the minute particles of lime held in suspension in the vapor, which assists in detaching the membranes from the air-tubes. An occasional vomit of mustard and water, a tablespoonful to the half-pint, or of equal parts of alum and molasses in tablespoonful doses, is advisable in most instances, pending the arrival of the physician who should be summoned at the first moment of alarm. Very few physicians will blame a parent for instituting the measures just recommended before he reaches the bedside. Anything more active is hardly safe in unprofessional hands, unless it be the rubbing of the throat and chest with a lotion of turpentine and sweet-oil (half and half), the turpentine liniment of the apothecary shops [or that described in the chapter of Formulas].

Should the case be urgent and no medical aid be at command, more active measures may be resorted to to induce vomiting, if those mentioned are insufficient. The vomiting is very necessary in order to excite involuntary expectoration in young children, whose air-passages are rather tolerant of accumulating products, and who cannot be taught to make voluntary efforts at cough and expectoration. In larger children this necessity for the emetic is not so urgent, and sometimes is entirely wanting. In the action of an emetic there is a perspiration, so to speak, excited in the interior of the air-passage, similar to the visible perspiration in the skin so often accompanying this act. This loosens and detaches the membrane and excites the paroxysms of cough by which it is expelled. Before there is any membrane it is worse than useless to vomit the child; it may be injured and so reduced by it—for all emetics are weakening—that it will not have strength to withstand this treatment when the time comes for its judicious administration. On account of this debilitating tendency, tartar-emetic, or antimonial wine, sulphate of mercury (turpeth mineral), or sulphate of copper, should never be used to vomit a young child except by the advice of a competent attendant who knows what he is about, and usually has some special reason for resorting to these measures. Syrup of ipecac (one teaspoonful to a child about a year of age, and a tablespoonful to one of twelve years) may be used instead, and repeated, if it does not operate, every ten minutes for two or three doses and no more; for, if the emetic fail to vomit and be retained in the stomach, it not only is liable to produce injurious effects at the time, but will do so afterward if the child gets better and stronger, when the stomach and intestines, resuming their functions, absorb, to their detriment, the drugs that lay inert, like a drug in a box, while these organs remain too de-

pressed to absorb them. Tickling the back part of the throat with a feather, or passing the forefinger down the gullet, is sometimes successful mechanically even when drugs fail, and should be resorted to in preference to powerful drugs, if simple emetics like the mustard or alum fail to effect their purpose. But, before any emetic is used, it must be certain that there is an indication for it. This is surmised by the rattling in the windpipe beneath the breastbone, and the difficulty in breathing freely. The emetic may be repeated every six or four hours with young children, and on a return of symptoms with children of a few years of age. If the bowels have not been moved recently, a dose of castor-oil or of magnesia sufficient to produce a loose stool should be employed. The diet of a young child should be milk only ; but eggs, light meat-broths, and a moderate amount of farinaceous food (corn-starch, arrow-root, tapioca, farina, and so on) may be given to a child of two years of age or more. If the child is weak, a dose of quinia (half a grain to two grains to a child under two years, and three to four grains to one from four to six years or more) may be given and be repeated at intervals of six or eight hours ; or the tincture of chloride of iron may be given (two drops to a child under one year, three to five drops to one from two to three, and ten drops to one of ten or twelve) at intervals of four or six hours. If there is much evidence of inflammation in the throat, the neck may be enveloped in a wet poultice of raw cotton or spongio-piline, which is to be covered with a layer of oiled silk or oiled paper, to retard evaporation and keep up the moisture.

When the voice and cough become muffled, showing the formation of membrane, the temperature of the apartment is to be elevated to 85° or 90°, and the atmosphere is to be kept more copiously loaded with steam to keep the products soft and easy of expectoration. If the methods already narrated are insufficient, wet cloths may be hung around the bed or crib, and be changed from time to time. A wash-boiler may be brought to the bedside and the immersion and withdrawal of towels be kept up. A large tin-pan of water may be placed on a portable stove near the patient and kept boiling, the vapor being directed over the mouth by means of large sheets of stiff paper, or some other contrivance. Care must be taken to keep up this evolution of steam without cessation. The air of the bedroom should be kept ventilated by an open window in an adjoining room or stairway, a screen formed by a sheet hung over a line being placed in front of the door of communication, or around the bed or crib, to protect the patient from draught. If the room is large, the bed may be brought close to the stove, with sheets hung around it so as to retain the steam in its vicinity.

The writer knows of no treatment more efficacious than the steaming in this stage.

When respiration becomes difficult from accumulation of membrane in the air-passages, small pieces of lime should be slacked by the side of the bed, in any convenient vessel, and the fumes that rise from it be directed toward the mouth of the patient by a funnel-shaped cone of stiff wrapping-paper, or a stiff paper bag (such as a flour-bag) with one corner cut off, and inverted over the vessel. The patient must not be brought too near the hot vapor, and the attendant in charge should protect the eyes by the hand or by a cloth. This should be kept up for ten or fifteen minutes at a time and be repeated every half-hour, hour, or at longer intervals, according to circumstances, the indication for its removal being increased difficulty in respiration. It excites cough and the extrication of quantities of the false membrane.

This treatment by steaming and lime is apt to produce capillary bronchitis and even inflammation of the lungs, which require attention subsequently, but it often succeeds in overcoming the fatal effects of the croup when nothing else will do so. Care must be taken to avoid exposure after treatment of this kind, and the withdrawal of the steam and diminution of the temperature should be accomplished gradually after they have become no longer requisite. When the writer has been asked professionally how it will be known when the ebullition of steam is sufficient in bad cases, he has been accustomed to reply, "When the wall-paper gets loose from the walls."

During all this time care must be taken to sustain the child by food, stimulating it, if requisite, by the free use of alcoholic liquor in some form.

[Owing to the prompt relief which often follows the thorough inhalation of steam or vapor, and the difficulty which may sometimes be met with at night and in a cool room in filling the air with the necessary amount of vapor, the following plan may be found serviceable:

The child being put into a crib or cradle, if it is not already in one, it should be covered with a heavy blanket or quilt supported on chairs, or the ends of the crib, if they are high, or upon barrel-hoops fastened to the head and foot, so as to form an enclosed air-space.

If a gas-stove or kerosene-stove is at hand, a tea-kettle partly filled with water may be put on it and arranged at the side of the crib so as to be covered by the blanket. Some person should sit constantly by the crib, with the head under the covering, to prevent the child being alarmed by the procedure, to regulate the

amount of steam, guard against the clothing taking fire from the stove, and prevent the limbs of the child being scalded by coming too closely in contact with the escaping steam.

Where a portable stove of the kind mentioned is not obtainable, a large dish, such as is used in making cake, can be partly filled

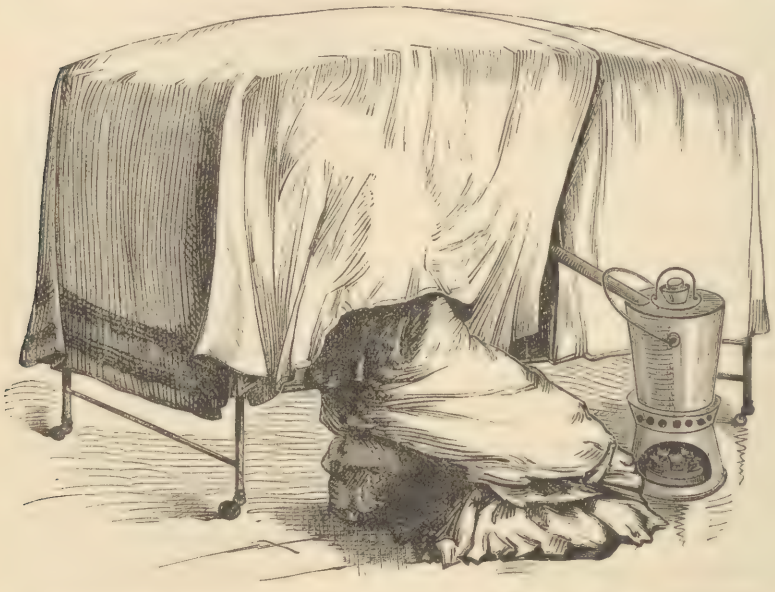


FIGURE 125.—Arrangement of a crib with blankets for using a croup-kettle.

with boiling water and will give off steam for several minutes. By heating smoothing-irons, or pieces of brick, and immersing them gradually into the water in the bowl, an abundance of steam can be formed. Lime can also be slacked in a dish so arranged without the necessity of filling the entire room with its vapor.

Another method of limiting the space to be filled with vapor is to choose a corner of the room into which the crib can be put, and a blanket hung across so as to form a curtain.]

The remarks concerning tracheotomy in diphtheria (p. 392) are equally applicable to croup.

SPASM OF THE LARYNX—FALSE CROUP.

Spasm of the larynx is not an infrequent disease of young children, and is often mistaken for croup. It is a nervous affection, due to what is known as "reflex irritation." The exciting cause may be indigestion (especially during teething), worms, earache, or run-

ning ears, elongated fore-skin, glandular swellings anywhere, rickets, or scrofula. There is no special impairment of general health. There is a sudden attack of difficult breathing, with a peculiar stridulous or crowing noise in the throat, and after the spasm has lasted a few seconds or a minute, it usually gives way, and then there is no more evidence of disease than before. The voice is good; there is little or no sore throat. The larynx becomes spasmodically closed in the paroxysm, and if it does not let up in a minute or so, death from suffocation may result. This result is rare, but does occur now and then. These attacks are more frequent at night, but take place in the daytime also, and may recur several times in the twenty-four hours, or at longer and irregular intervals. The disease also occurs in adults, and is a reflex manifestion due to diseased conditions elsewhere, the same in nature, though not always the same in kind, as in the child. Though the disease is comparatively rare in the adult, it is, perhaps, even more proportionately fatal.

The Treatment of this disease during the suffocative spasm consists in dashing cold water on the face and chest, in holding ammonia near the nose, the use of one of the emetics recommended in the foregoing section, and immersion in a warm bath, if accessible. In a child subject to these spasms, a warm bath should always be at command. In the intervals, such general treatment is required as the nature of the case demands. Swollen gums should be scarified, the bowels should be kept in good condition, running ears should be kept well syringed, and so on. In addition to this, cod-liver oil or extract of malt are often of great value, with warm clothing, avoidance of draughts of air, and of all measures calculated to alarm or excite the child. Bromide of potassium and belladonna are the drugs most frequently serviceable to counteract the tendency to spasm, but they must be given in accordance with the direction of an attending physician.

Aphonia—Loss of Voice.

Aphonia, or loss of voice, without any other evidence of disease, is usually a nervous complaint, due to paralysis of the vocal cords, as a reflex result of disease elsewhere. It usually occurs in females, and most frequently in hysterical individuals. Sometimes it persists for weeks or months, occasionally for years ; but in most instances the voice comes and goes at irregular intervals of a few days or a few weeks.

Aphonia is sometimes due to tumors of various kinds in the head, neck, and chest, compressing the nerves that are necessary

for the muscular movements of the voice ; and in these instances the paralysis is usually unilateral. Loss of voice also accompanies some cases of inflammation of the larynx ; and sometimes is due to the presence of warts or other morbid growths which prevent the vocal cords from being properly approximated. A laryngoscopic examination is usually necessary to determine the nature of the aphonia.

Treatment.—Simple nervous aphonia is usually cured promptly by the passage of a current of electricity through the vocal cords. Sometimes an acrid inhalation will restore the voice by inducing, for the moment, spasm of the cords, thus overcoming the paralysis. The passage of a sponge into the larynx will often do the same thing. Sometimes it can be accomplished by the action of a smart emetic. The use of a tonic, such as quinia, or cinchonidia (which is much cheaper and just as efficacious), in doses of from three to ten grains in the twenty-four hours, is often serviceable. Aphonia from inflammation of the larynx will pass off with the inflammation. Aphonia from disease of the brain, neck, or chest, requires treatment for the original disease, all merely local treatment being injurious. Aphonia from tumors in the larynx requires the removal or destruction of such growths. Reflex aphonia requires treatment of the organ from which the reflex paralysis originates (womb, bowels, spinal cord, etc.).

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Diseases of the Respiratory Organs.

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DISEASES OF THE RESPIRATORY ORGANS.

Bronchitis.

This disease is sometimes called *bronchial catarrh.* It may be *acute* or *chronic.* In character it may be mild or severe; may involve only the larger bronchial tubes, or it may extend into those of small size. When the smaller tubes are involved, the disease is called *capillary bronchitis.* Bronchitis rarely originates in the bronchial tubes, but is the extension of a catarrhal process which has affected the mucous membrane of the nasal passages, the back part of the throat, and the upper part of the windpipe (the larynx).

Causes.—There are certain conditions which predispose or prepare a person for an attack of acute bronchial catarrh; such as infancy, old age, indulgence in anything which debilitates, breathing impure air in badly ventilated apartments, and sudden changes of temperature. When the body is improperly protected, the action of cold upon the surface very frequently causes a chilling which is followed by an attack of bronchitis.

Bronchitis may prevail epidemically, when it is produced by some unknown atmospheric influence, such as is present when influenza prevails. It may also be developed as an element of measles and the infectious fevers, as well as in connection with all those diseases which are due to blood-poisoning, as rheumatism, gout, etc. It occurs quite frequently in connection with chronic heart disease and during the course of the different chronic diseases of the respiratory organs. It may also be produced by the inhalation of irritating gases, vapors, and particles of dust, such as millers, bakers, stone-cutters, and grain-heavers are exposed to; these act directly upon the mucous membrane, and by mechanical irritation cause congestion and inflammation.

Symptoms.—A simple form of bronchitis, or bronchial catarrh, is a "common cold." In this form, only the windpipe and the first and second divisions of the bronchi are affected. It usually comes on with chilliness, more or less sore throat, hoarseness, and an uncomfortable feeling over the eyebrows, a copious flow of tears, and a watery discharge from the nose. The common form for expressing this condition in an individual is, "he has caught

cold and is all stuffed up." There is aching of the back and limbs and a slight febrile excitement. In young and weakly children convulsions may occur. As the disease advances and extends into the bronchi, more or less pain and discomfort is felt across the upper portion of the chest, with a sense of rawness and soreness, particularly behind the breast-bone; this becomes more painful after coughing, not unfrequently there is a sensation of tightness. The respirations are increased in frequency, and become somewhat labored. The cough is the most noticeable and the most important symptom. At first it is harsh without expectoration; sometimes it is incessant, occasionally it is paroxysmal. The cough is usually most troublesome when the individual lies down, or when he wakes from a long sleep; sometimes he coughs and coughs, until he is quite exhausted.

At first, the expectoration is watery, then, as the cough becomes loose, it is frothy and more abundant, gradually it becomes opaque and has a yellowish color, and finally becomes a thick, yellow, gelatinous mass. The individual is generally relieved as the expectoration becomes profuse. This acute catarrh may last no longer than two or three days, or it may continue two or three weeks. Usually it terminates in complete recovery. This form of bronchitis does not destroy life unless it occurs in very young children. When it becomes chronic it usually extends into the bronchial tubes.

Treatment.—If an ordinarily healthy person takes cold, and has a simple attack of bronchitis, it can generally be arrested by a warm bath at bed-time, followed by the administration of eight or ten grains of Dover's powder. The following morning he should take some saline cathartic (such as Epsom salt) or a full dose of castor oil; the latter is preferable in the treatment of children.

Sometimes three tablespoonfuls of whiskey in a tumbler of hot lemonade taken at bed-time will accomplish the desired result. A person should remain in a warm, equable temperature for a day or two after resorting to this plan of treatment. If it has proved unsuccessful, or has not been resorted to, and the disease has progressed so that a person has a cough, with a sense of rawness and tightness across the upper portion of the chest, with perhaps some chilliness and more or less aching in the limbs, induce profuse perspiration, apply mustard paste across the upper portion of the chest, administer a saline purge, and let him drink freely of some saline water (such as Vichy water). If the unfavorable symptoms continue after these means have been employed, send for a physician.

Especially be on the watch as regards very old persons and young children, whenever their breathing becomes labored, and the respirations are increased in frequency. If the pulse reaches 100 beats per minute, and the temperature, as indicated by the thermometer in the arm-pit, registers 102° Fahr., it is important that you should immediately consult a physician.

Acute Capillary Bronchitis.

A bronchitis is called *capillary* when the inflammation has invaded the small bronchial tubes. In the majority of cases, this form of bronchitis is an extension of the bronchial catarrh from the larger to the smaller tubes; occasionally the bronchial inflammation begins in the small tubes.

Capillary bronchitis is met with most frequently during infancy and old age; occurring at any other period it complicates some disease which has already placed the individual under the care of a physician.

Causes.—Capillary bronchitis and simple bronchitis are the results of similar causes. There is great danger that simple may become capillary bronchitis; especially is this true when it complicates measles, whooping-cough, or some of the chronic maladies, such as Bright's disease of the kidneys, etc.

Symptoms.—The most marked symptom of capillary bronchitis, whether it is a sequence of simple bronchitis, or a complication of measles or any chronic disease, is frequent and labored respiration. An individual suffering from this form of bronchitis may have sixty or seventy respirations per minute and be unable to lie down on account of shortness of breath. Great muscular effort will attend each respiratory act. The face will be flushed and anxious. The pulse will reach 130 or 140 per minute, and the body temperature may rise to 103° F. In some cases the temperature may be below normal and the pulse may be exceedingly frequent and feeble, evidencing extreme exhaustion. At its commencement the individual will have a short, hacking cough, sometimes paroxysmal in character. At first the expectoration is scanty, then thick and tenacious; in severe cases it is accompanied by a rattling sound. After a time the lips and also the tips of the fingers become blue, the veins in the neck become turgid, the breathing becomes more and more labored, and, as the patient shows signs of exhaustion, frequently a profuse, frothy, watery expectoration comes on, which affords no relief to the sufferer. Soon signs of suffocation are present, the body becomes covered with a clammy sweat, the pulse becomes small, the respiratory

efforts are more and more feeble, cough and expectoration cease, and death occurs from suffocation. General capillary bronchitis is a grave disease; especially is it fatal when occurring in infancy or old age.

Treatment.—The principal thing to be accomplished in the treatment of this affection is to sustain life until the inflammatory process has passed through its different stages.

Whenever the prominent symptoms of the disease begin to be developed, the aid of a physician should be immediately sought. If they come on suddenly, and some hours may elapse before the physician can reach the individual, the following measures should at once be resorted to. Keep the temperature of the room at 70° Fahr., and keep the air about the person moist with steam. Give him a warm bath, or wrap about him a flannel blanket wet in hot water, then cover the body with a dry blanket. The air may be rendered moist by dropping heated bricks into buckets of water placed around the individual. If the face becomes blue, and the pulse feeble, stimulants may be freely administered.

Under *no circumstances* should opiates be administered to persons with capillary bronchitis.

Membranous Bronchitis.

This is a rare form of bronchitis. It may run an acute or chronic course. It occurs most frequently in young adults, and is more common among females than among males. It is characterized by a membranous exudation upon the surface of the lining membrane of the bronchial tubes. This exudation may be in the form of a hollow or cylindrical cast. The former usually occurs in the large tubes, the latter in the tubes of small size. In some cases the exudation so completely lines and fills the bronchial tubes, that casts of the tubes of the size of a small thread are expectorated. Usually these casts are of a dull, white color.

Cause.—The cause of this form of bronchitis is by no means certain.

Symptoms.—There are no symptoms of obstruction in the windpipe such as are met with in croup.

In the *acute* form, the expectoration of the exudation-casts is preceded by the symptoms of an ordinary acute catarrh. When the disease is fully developed, there is fever, difficult breathing, a dry, hoarse cough, and a sense of constriction and oppression across the chest. After violent coughing the membranous exudation is spat out, and its presence in the expectoration determines the nature of the bronchitis.

Symptoms of the *chronic* form of this trouble are never continuous; there are paroxysms of disease and intervals when the patient is apparently perfectly free from the malady. During violent fits of coughing, fragments of exudation or casts of the tubes are expelled. As soon as this occurs the patient is relieved until another membranous exudation takes place, the removal of which gives rise to similar phenomena. In some cases scarcely any symptoms are present except the cough and membranous expectoration. There are exceptional cases in which the detachment and expulsion of the casts takes place during sleep.

A single attack of this disease rarely occurs. An individual having once suffered from membranous bronchitis will probably have repeated attacks of it. The acute form is generally followed by serious results; the chronic form rarely terminates fatally, but in most cases is never completely recovered from, and frequently leads to the development of consumption.

Treatment.—There is no known remedy or plan of treatment which insures recovery. During the paroxysms the patient should be kept in a warm, equable temperature, and steam inhalations should at once be resorted to and continued until the paroxysm is relieved. During the intervals, exposure to all sources of bronchial irritation, such as inhalation of dust and irritating gases, should be carefully avoided, and the general health of the individual should be cared for.

In chronic membranous bronchitis, a physician's advice in regard to the general hygiene of the patient during the intervals is of great importance.

Chronic Bronchitis.

This disease may occur during childhood, but it is essentially a malady of adult life. One of its leading features is its tendency to recurrence; the attacks increasing in severity and duration, until the individual is rarely free from some manifestation of the disease.

Cause.—Chronic bronchitis may be the sequence of some other affection, or it may follow an acute bronchitis. Very rarely is it developed in consequence of exposure without some special predisposition, such as long-continued irritation of the bronchial membrane, constitutional tendency, or some previously existing organic disease. In the case of stone-cutters, knife-grinders, coal-miners, operatives in factories, etc., the inhalation of some mechanical irritant may affect the bronchial tubes for many years, and yet the individual may have scarcely any noticeable bronchial

symptoms, until an exposure to wet and cold results in acute bronchitis; this will be followed by a catarrh which may remain during life, and the disease known as stone-cutter's, or knife-grinder's consumption will be developed.

The continued inhalation of impure air, such as is met with in badly ventilated apartments, crowded assemblies, etc., predisposes the individual to attacks of bronchitis which may become chronic.

An hereditary or acquired tendency to gout often manifests itself in a form of chronic bronchitis. Frequently, in the same individual, attacks of bronchitis and gout alternate; occasionally, also, is chronic bronchitis developed in connection with some skin disease. When one is active, the other disappears.

Diseases of the heart predispose to bronchitis, and when bronchitis occurs under such conditions, its course is protracted and the danger increased.

Chronic alcoholism (the prolonged and excessive use of alcoholic stimulants) is often a cause of chronic bronchitis.

There is a condition of the lungs which very strongly favors the development of chronic bronchitis, viz., dilatation of the air-cells (pulmonary emphysema). Indeed, when emphysema exists, it is almost invariably accompanied by chronic bronchitis.

Symptoms.—The symptoms of this disease vary with the circumstances under which it is developed. Cough and expectoration are present in nearly every case. The peculiarity of the cough, the quantity and quality of the matter expectorated, determine, to a great extent, the character and severity of the bronchitis.

In the mildest form of chronic bronchitis, the cough is not severe, the expectoration is small in quantity, and whitish or yellow in color. At first, it comes on in the autumn and winter, and disappears or is mitigated in the summer, except as it is affected by cold, damp weather. When this form of bronchial catarrh has existed for some time, the cough becomes more violent and constant, and on rising in the morning, the individual coughs for an hour, or even a longer time, and expectorates. The matter expectorated is either scanty and tenacious, or thin, semi-transparent, and abundant; sometimes the matter is so sticky that it is with difficulty expelled. It varies in color from a light yellow to a dark green. The odor of the expectoration is sometimes sweet and nauseous, at other times the stench is almost intolerable. The fœtor is due to decomposition of secretion which has collected in dilated portions of the bronchial tubes. Cases in which this fetid odor is present are known as *fetid bronchitis.*

The excessive use of alcoholic stimulants is the predisposing cause.

There is another variety of chronic bronchitis, which has received the name of dry catarrh. In this form, the expectoration usually appears in small, rounded masses of semi-transparent, tough mucus. Dry catarrh is commonly met with in persons suffering from gout, dilatation of the air-cells of the lung (pulmonary emphysema), and in those whose occupation compels them to inhale irritating substances, such as dust from mills, marble and stone yards, etc.

If chronic bronchitis accompanies chronic disease of the heart, the cough is usually paroxysmal—often violent. In most cases, when the paroxysm of coughing comes on, there is a flux from the bronchial tubes, and within twenty-four hours the patient may expectorate three or four pints of watery, semi-transparent, ropy, or gelatinous material, resembling the white of an egg mixed with water. In every variety of chronic bronchitis labored and difficult respiration is a prominent symptom, yet the respirations may not be so frequent as in some other pulmonary affections.

Ordinarily, in chronic bronchitis, the pulse is not more frequent, neither is the temperature higher than normal (98½° Fahr.).

In those cases in which the expectoration is fetid, the temperature is elevated one or two degrees. Persons suffering from chronic bronchitis, no matter what form of the affection they have, become exhausted on slight physical exertion, and are very susceptible to changes of temperature.

This disease seldom, if ever, directly destroys life, and yet, when developed in a person past middle life, is rarely entirely recovered from. There are many persons who have coughed and expectorated for twenty or thirty years ; whose shoulders have become rounded, and whose chest-expansion has become greatly diminished, who are otherwise comparatively healthy. They have suffered great annoyance, yet their lives have not apparently been shortened by the disease. A casual observer might suppose from the appearance of such individuals, that they were suffering from consumption. Many of the so-called wonderful cures of consumption of many years' standing are merely partial recoveries from chronic bronchitis.

Treatment.—In order to treat chronic bronchitis successfully or judiciously, the peculiarities of each case must be carefully studied. Cough is one of its most prominent and troublesome symptoms, yet the cough is not to be treated as though it were the disease. If we do this no permanent relief will be obtained. In the majority of instances the disease is due either to vitiated

air, or some previously existing malady. If the cause can be ascertained, if possible let it be at once removed. For example, if it depends upon the irritation produced by inhalation of particles of dust, such as float in the air of woollen mills, flouring mills, bakeries, grain elevators, etc., at once remove the patient from such exposure if possible. Such a patient must avoid sudden changes of temperature. The surface of the body must be protected by flannel—covering the chest is not sufficient; and the flannel must be worn throughout the entire year. The feet must be kept warm and dry. The danger of developing bronchitis by wearing damp shoes or boots after active exercise is not fully appreciated. Night air should be avoided.

The climate best adapted to all forms of bronchitis is one with a moderately warm and dry atmosphere, in a moderately high altitude and protected from cold winds. If a person with chronic bronchitis cannot remove to a favorable climate, he should avoid exposure during bad weather and remain in a well-ventilated apartment, with a temperature varying from 65° to 70° Fahr.

The opinion has come to be quite common that the temperature of sleeping apartments should be several degrees lower than that of the rooms occupied during the day. The necessity of free ventilation in sleeping apartments cannot be too strongly urged; yet, one can hardly understand how a sudden transition from a warm sitting-room to a cold sleeping apartment can be beneficial, when under other circumstances it is harmful. I am positive that the sleeping rooms of persons with chronic bronchitis and those which they occupy during the day, should be of the same temperature. The diet of those suffering with chronic bronchitis should be of the most nutritious articles, but they should never be taken in large quantities at any one time.

The question is often asked whether stimulants are beneficial in chronic bronchitis. This question cannot be answered without some qualifications. Unquestionably, in the majority, yet not in all cases, the moderate use of stimulants will prove beneficial; a glass of claret wine or cider, taken at dinner, will be of service.

A tonic plan of treatment is generally indicated. If the individual is anæmic—that is, pale, and feeble—and suffers from palpitation of the heart, some preparation of iron is indicated; tincture of iron is the one I usually employ. This may be taken, ten drops at a time, in a tablespoonful of some bitter infusion, like that of columbo, quassia, gentian, or wild-cherry bark, etc. Any of these infusions may be made by steeping half an ounce of the bruised root or bark in a pint of water.

As has already been stated, the peculiarities of each case should be carefully noticed. If chronic bronchitis accompanies gout or rheumatism, colchicum and alkalies will be found beneficial in its treatment. For the gouty condition, twenty drops of the wine of colchicum in water may be taken three times each day. For rheumatism, the bicarbonate of soda is as good an alkali as can be taken, five to ten grains at a dose, three times each day. Its use should not be continued more than four or five days at any one time.

If the bowels are inclined to constipation, a teaspoonful of Rochelle salt in one-half tumbler of water may be taken before breakfast. If chronic bronchitis accompanies chronic heart disease, in its treatment we should aim to relieve the heart.

Persons with chronic bronchitis are generally endeavoring to relieve symptoms ; they seek for something which will cure their cough and diminish expectoration. They are very likely to make a trial of the different patented medicines which are advertised to cure bronchitis, and a great variety of inhalations and balsams will be experimented with ; many of these may afford temporary relief, but they will certainly leave the person in a worse condition than he was before their use was commenced. When bronchial secretions are excessive, they may be diminished and the condition of the patient much improved by the inhalation of steam from water impregnated with tar, creasote, carbolic acid, iodine, balsams, etc. Usually, such inhalations will remove the fœtor which is sometimes met with in the breath and expectoration of those suffering from chronic bronchitis.

In the absence of more complete apparatus, vapor impregnated with these substances may be inhaled in the following manner : Pour into an ordinary quart stone jug about a pint of boiling water, to which add a teaspoonful of oil of tar, creasote, carbolic acid, tincture of iodine, or any other similar volatile substance,—then let the individual place his face over the mouth of the jug and inhale the medicated vapor. During the inhalation the jug and the head of the patient should be covered with a towel or cloth to prevent the escape of the steam. Relief will be afforded if this is done for a few moments at a time, three or four times during the day. Any of these remedies can be taken internally at the same time.

If the bronchial secretion is scanty, adhesive in character, and is with difficulty expectorated, the cough being attended with violent paroxysms, anodynes may be used with the vapor inhalations. Pills containing one grain of the extract of henbane, and one grain of ipecac, may be found of service. Two or three of these may be taken within twenty-four hours.

In that form of chronic bronchitis so commonly met with in elderly people, called "a winter's cold," I have found great benefit derived from drinking hot milk and Selters water before rising in the morning. Fill a tumbler with equal parts of boiling milk and Selters water, and let the patient drink its contents half an hour before rising. This should be continued through the winter months.

Asthma.

Asthma is so common a disease, that nearly every one is familiar with its prominent symptoms; yet medical men have differed in regard to its exact nature. At the present time it is almost universally regarded as a spasmodic affection of the bronchial tubes, due undoubtedly to reflex nervous action. Asthmatic paroxysms are usually accompanied by a more or less severe bronchial catarrh, which may sometimes precede, and sometimes follow the paroxysm.

Persons suffering from organic disease of the heart may have asthmatic attacks, although true asthma is spasmodic.

Causes.—Unquestionably, the primary cause of asthma is some constitutional tendency, which is generally hereditary. I have seen a well-marked paroxysm of asthma in an infant six weeks old and born of an asthmatic mother. The exciting causes of asthma are numerous, but they may be conveniently arranged into three classes:

First. There is a class of cases in which the bronchial spasm is excited by the inhalation of some irritating substance, which acts directly upon the bronchial mucous membrane. In this class are included those cases in which the attack is excited by the emanations from new-mown hay (this form of asthma is called *hay-asthma*), from various flowers, from certain animals, as the cat and dog, from warm milk, powdered ipecac, tobacco, etc.

Second. There are cases in which the bronchial spasm depends upon causes within the human body; technically speaking, they are reflex in their origin. For example, an attack of asthma may be induced by error in diet, by uterine irritation, by the sudden application of cold to the surface of the body, by an overloaded rectum, or by violent exertion.

Third. Asthma occurs in connection with other diseases, such as chronic bronchitis, dilatation of the air-cells of the lungs (pulmonary emphysema), heart disease, etc.

Every person who has long been subject to attacks of asthma knows what will bring on a paroxysm in his individual case, and he is susceptible only to that exciting cause.

Symptoms.—An individual who has had repeated attacks of asthma, also knows when he is about to have a paroxysm by certain sensations which are peculiar to himself, and which no one else can so well appreciate: such as itching of the chin, wakefulness, a peculiar headache, etc.

Hay-asthma is always preceded or accompanied by sneezing, suffusion of the eyes, running at the nose, and bronchitis. Persons having this form of asthma may have suffered for years with irritation of the mucous membrane of the eyes, nose, and throat, whenever they have been exposed to the emanations which ordinarily produce it, without having had a distinct asthmatic paroxysm; yet asthmatic paroxysms are sure to be developed sooner or later, differing in no respect from asthmatic paroxysms excited by other causes.

In most cases, these paroxysms come on during the night; the individual goes to bed and falls asleep, the characteristic wheezing commences, and he soon awakes suffering from a most distressing attack of difficult breathing.

If you carefully notice a person suffering from a severe asthmatic paroxysm, you will find that the entire upper portion of the chest is motionless, and that the motion in the lower portion is limited. There is marked rigidity of the muscles passing from the head to the shoulders, to the collar-bone, and to the ribs. The head is fixed, the shoulders are elevated and brought forward, the individual bends forward and rests his elbow upon his knees, with mouth open, and eyes prominent. The surface is covered with a profuse perspiration, the face is flushed or livid, the breathing is laborious, and noisy or wheezing in character, and the individual hastens to an open window or door hoping to find relief.

The duration of the paroxysms varies; sometimes they last only for a few moments, at other times they continue for hours; in exceptional cases they continue two or three days without intermission. If the paroxysm is prolonged, the extremities become cold, blue, and shrunken, and the individual appears to be dying; death, however, rarely occurs from uncomplicated asthma.

The attack usually terminates by free expectoration. In some cases the expectoration is a thick, tenacious mucus; in other cases it is watery and frothy; and in still other cases there may be only a few small rounded masses coughed up before relief is obtained.

These attacks have a marked tendency to recur; the length of the interval between them varies. Some individuals have an attack only once during the year; others have an attack every month; and again others have an attack only when brought under the influence of some special exciting cause.

The condition of the individual during the intervals will vary according to the nature of any organic disease with which he may otherwise be affected. If no organic disease exists, some persons are quite well during the interval; others have an almost constant sense of constriction in the chest, which renders the breathing somewhat labored, especially during exercise. Some suffer from a bronchial or nasal catarrh, which constantly predisposes them to an asthmatic paroxysm on slight exposure.

Those who are subject to repeated attacks of asthma find it absolutely necessary to observe a rigid hygiene, in order to escape their attacks, and it is probably due to this fact that this class of persons are generally long-lived.

If the first attack comes on previous to adult life, the interval between the paroxysms is usually long, and complete recovery is possible. Yet the fact that an individual has had one attack is strong presumptive evidence that he will have a second one. If the paroxysms can be traced to some cause that may be avoided, the chances of complete recovery are good.

Treatment.—There are two things to be considered in the treatment of this affection.

First, the management of the paroxysm.

Second, the treatment of the individual during the interval, with a view to correct the constitutional condition, upon which the tendency to the recurrence of the paroxysms depends.

The object of treatment when the paroxysm is present, is to lessen the sufferings of the individual and to shorten the duration of the attack. Ascertain the exciting cause of the attack, and if possible remove it. If the paroxysm depends upon indigestion or upon an overloaded stomach, administer an emetic—a large draught of lukewarm water, a teaspoonful of mustard in half a pint of water, or from twenty to thirty grains of ipecac may be employed. If the attack depends upon the disturbing influence of an overloaded rectum, use a large injection of warm water containing a tablespoonful of common salt. If smoke, dust, or any animal or vegetable emanation is the cause of the attack, the individual must avoid its inhalation. If in a certain locality the individual has frequent attacks of asthma, let him remove to one in which he is free from the paroxysm. Not unfrequently, permanent relief will be afforded simply by a change of residence.

If the exciting cause is such that it cannot be removed, or if its removal is not followed by immediate relief, the individual should be placed in a position in which the respiration can be carried on with the greatest ease. During an attack, the sitting posture is usually the most comfortable position if a chair is used which

will give support to the arms, and so elevate the shoulders. The apartment should be kept at a temperature of 65° Fahr., and freely ventilated. Next, we should select those remedial agents best adapted to afford relief.

The great majority of persons suffering from asthma acquire a practical knowledge of those remedies best suited to their own cases. For an emetic, ipecac, tobacco, and lobelia are remedies which have long been employed in the treatment of asthma ; and stramonium leaves, Indian hemp, hyoscyamus, ether, chloroform, and opium, are remedies familiar to those who have had frequent attacks of the disease. Some will be promptly relieved by the inhalation of the fumes of stramonium leaves ; others, by the inhalation of a small amount of ether or chloroform ; and again others, by the fumes of burning nitre-paper. Chloroform is an agent which will generally relieve, temporarily, an asthmatic paroxysm ; but the difficulty is, that as soon as the effects of the drug have passed off, the paroxysm returns with increased severity. Opium in moderate doses will frequently afford relief ; the following is a very good combination, viz. :

Compound spirits of ether.	One ounce.
Sulphate of morphia.....	One grain.
Water.....	One ounce.

Of this mixture, a teaspoonful in a little water may be taken every half-hour until relief is obtained.

Nitre-paper is one of the oldest and best remedies for asthma. (It is prepared by dipping ordinary paper in a saturated solution of saltpetre.) When this is used, it is necessary that the apartment occupied should be filled with the fumes of the burning paper ; if it relieves, it will do so very quickly.

Coffee and alcohol have become quite favorite remedies in the treatment of asthma. Coffee is to be preferred. It should be strong and clear, as hot as it can be swallowed, and should be taken previous to eating. Often a paroxysm may be warded off by taking two or three cups of strong coffee immediately upon the occasion of the first asthmatic symptom.

Caffeine in two-grain doses, repeated every half-hour, acts in the same manner, and as it is tasteless may sometimes be preferred. Alcoholic stimulants sometimes afford relief. It is of little importance what alcoholic stimulant is employed, but in order to have any marked effect in arresting an asthmatic paroxysm, it must be taken hot and in quantities sufficient for the individual suffering from asthma to feel its intoxicating effects. Whatever

remedial agent affords relief, after a time it will cease to have the desired effect, and a new one must be tried. The three most reliable remedial agents are ipecac, opium, and coffee.

The treatment during the interval between paroxysms must be altogether hygienic, for there are no known remedies which will prevent their recurrence. Usually, asthmatic individuals are dyspeptic. Since proper care with respect to diet will afford exemption from many asthmatic attacks, each individual should make his own case a special study in this regard. In those cases which depend for their development upon certain atmospheric conditions, a change of residence is all-important. There is no rule in regard to such a change ; each individual must decide for himself, finding by trial in what place he is free from an attack of asthma. If the individual is feeble and poorly nourished, cod-liver oil and iron are of service in preventing a paroxysm.

On all questions of general treatment, the advice of a physician should be sought.

Pulmonary Emphysema.

In *pulmonary emphysema*, or *dilatation of the air-cells of the lungs*, there may be simple dilatation of the air-cells without rupture of their walls, or the two may exist simultaneously. Such dilatation leads to the formation of air-sacs, which vary in size from a pin's head to that of a walnut or even larger. As a result of the rupture and disappearance of the walls of the air-cells, the fine net-work of blood-vessels which surround the air-cells becomes obliterated, and this interferes more or less with the circulation of the blood in the lungs. Usually both lungs are affected.

This disease seldom occurs except in connection with bronchitis and asthma, although it may exist independently of these. It is essentially a chronic affection, comes on slowly, and when once developed is permanent.

Causes.—Forced expiratory efforts, such as occur with violent paroxysms of coughing, straining at stool, etc., etc., may cause this disease. In many persons there exists either a hereditary or an acquired impairment of the elasticity of the lungs, which renders the walls of the air-cells more easily dilated, and more easily ruptured than usual. Several theories have been advanced to account for this impairment, but no theory is altogether satisfactory.

Dilatation of air-cells may take place around small portions of lung tissue rendered inexpansible by disease, such as occurs in collapse of some lobules due to obstruction of the bronchial tubes leading to them. As a result of bronchial obstruction and pulmo-

nary collapse, the air-cells immediately adjacent to them become over-distended by a forced inspiration or a forced expiration. In such instances, the extra distention of some air-cells compensates for the want of those which are rendered inexpansible.

Symptoms.—The most prominent and constant symptom of pulmonary emphysema is difficult breathing. When the disease is advanced, very slight physical exertion will cause difficulty of breathing; if the disease is slight, or in the early stage of its development, only violent and prolonged physical exertion will give rise to difficult breathing. In all cases the difficulty of respiration is less severe in summer than in winter. When cough is present it is due to bronchial irritation; if there is no bronchitis, there is no cough.

Expectoration varies with the character and extent of the bronchitis, and is not a part of the history of the emphysema. In advanced cases, the countenance is peculiar and somewhat characteristic; it is of a dusky hue, and has a puffy appearance which contrasts remarkably with the wasted appearance of the rest of the body. The nostrils are distended, thickened and vascular, and expand with each inspiration; the corners of the mouth are drawn downward, the voice is feeble, the individual stoops in the act of walking, and his whole body has a cachectic appearance. The circulation in the capillary blood-vessels of the extremities is remarkably imperfect on slight exertion. There is a gradual but steady loss of flesh and strength. Usually, there is no fever.

Individuals who have reached the advanced stage of this disease have characteristic paroxysms of coughing. As the attack comes on the face becomes flushed, the paroxysm gradually becomes more and more severe, and when it has reached its climax the face and hands become livid, and the body is covered with a cold perspiration. An interval of rest then follows; soon this is followed by another paroxysm; thus one paroxysm follows another without affording any very marked relief, until the individual is completely exhausted.

As the malady reaches a more advanced stage, the feet and ankles become swollen, there is more or less disturbance of the digestive functions, and the urine is scanty and high-colored. This class of individuals are more or less troubled with hemorrhoids and frequently lose large quantities of blood from the rectum.

In the advanced stage of emphysema the shape and movements of the chest are altered. There is an unnatural bulging of the upper portion in front, and an elevation of the breast-bone, giving to the entire chest a more rounded appearance than is natural,

which has been termed "barrel-shaped." The lower portion of the chest seems contracted, the shoulder-blades are drawn forward, and the individual habitually stoops. The muscles of the neck are unnaturally prominent. At the upper portion of the thorax expansion on inspiration is diminished or entirely wanting; the whole chest moves up and down with inspiration and expiration, as if it were composed of one solid piece, and lifted from the shoulders.

When the disease is once developed, recovery never takes place. To a greater or less extent it incapacitates an individual for active exercise; it renders life uncomfortable, but rarely, if ever, is it the direct cause of death. It increases the severity of an existing bronchitis, and renders one liable to fresh attacks.

Treatment.—Individuals suffering from pulmonary emphysema should carefully guard against taking cold, and should never expose the surface of the body to cold. Flannel should be worn next the skin throughout the year. All localities and conditions favorable to the development of this affection should be avoided. The diet should be the most nutritious and largely animal in character. Overloading the stomach should be carefully avoided, as well as the eating of those articles of food which have a tendency to produce flatulence. Only a small quantity of liquid should be taken into the stomach at any one time.

Systematic exercise in the open air should be taken daily, but it should not be carried to fatigue. All violent exercise or great physical exertion should be avoided. The regulation of diet and attention to general hygiene is of much more importance than the giving of medicine.

Iron is of great service in improving the general nutrition of individuals subject to this disease; the best preparation for this class of cases being the ethereal tincture of the acetate of iron, taken immediately after eating, in doses varying from five to twenty-five drops in water. Its use should be continued for some time. If dyspeptic symptoms are present, the mineral acid with the vegetable infusions will be found serviceable; the same which were recommended in the treatment of chronic bronchitis.

This disease has certain accompaniments which require special treatment. Of these chronic bronchitis stands first. In treating this bronchitis I have found iodide of potassium of special service; it should be administered in doses varying from five to twenty grains three times each day, and its use should be continued for some time.

In the treatment of heart and kidney complications, the services of a physician are required.

The same rules should govern one in the choice of climate for persons suffering from pulmonary emphysema as in the case of those suffering from chronic bronchitis or asthma.

Congestion of the Lungs—Œdema of the Lungs—Apoplexy of the Lungs.

These three diseases are closely allied to each other, and frequently they are concurrent. In some cases, when congestion of the lungs exists, it is difficult to determine whether œdema of the lungs is or is not present. In most cases, apoplexy of the lungs is associated with or preceded by congestion of the lungs.

Œdema of the Lungs.

In this disease the watery portion of the blood (the serum) finds its way into the cavities of the air-cells, and into the intercellular structure of the lungs. It commonly occurs as a complication of such maladies as Bright's disease of the kidneys, scurvy, purpura, etc. It may occur when the circulation in one portion of the lungs has been interfered with, as in pneumonia. It may also occur during the course of any acute infectious disease (such as typhus or typhoid fever), or any acute malady which is attended by heart failure.

Symptoms.—The prominent symptoms of œdema are difficulty in breathing and increased frequency in respiration. Frequently the difficulty in breathing is sudden in its advent and extreme in its character. Unless it complicates some acute disease, there is no febrile excitement; the temperature remains normal, the pulse is increased in frequency and is feeble. There is more or less cough attended by a watery expectoration which is colorless, unless congestion of the lungs is present, when it will be blood-stained. If the œdema is extensive, or if it complicates some other pulmonary disease, the lips become blue, the extremities cold and blue, the countenance anxious, and the distress of the individual extreme. These symptoms can readily be observed. Not unfrequently, œdema of the lungs occurs in connection with general dropsy and becomes an exceedingly dangerous complication, especially if the dropsy depends upon disease of the kidney or heart. When, therefore, an individual, ill with any form of disease which is attended by general dropsy, is suddenly seized with great difficulty of breathing, accompanied by cough and a profuse watery expectoration, it is almost positive evidence that œdema of the lungs

has been developed. Under such circumstances prompt and efficient medical aid is required.

Treatment.—Extensive œdema of the lungs is too dangerous a disease to be intrusted to the management of any one, save a competent physician.

If a physician cannot be immediately reached, dry cups should at once be applied over the entire chest, in front and behind. [See Chapter on Care of the Sick.] If these are not at hand, the chest should be covered with mustard poultices. If the œdema occurs with general dropsy, administer a full dose of Epsom salt, and, as quickly as possible, endeavor to induce free perspiration. If it comes on in the course of a fever, stimulants should be freely administered, until the aid of a physician can be obtained.

Congestion of the Lungs.

Congestion of the lungs may be either *active* or *passive;* that is, it may be the result of a larger than normal quantity of blood having been sent to the lungs in consequence of increase in the power and frequency of the heart's action, or it may be developed because there is obstruction to the return of blood from the lungs to the heart.

Causes.—In young persons with contracted chests, active congestion of the lungs may be produced by violent exercise, such as running, jumping, etc. It is probably this form of congestion which gives rise to the sudden distress sometimes felt when one is running against the wind. Active congestion of the lungs is also produced by breathing an atmosphere containing more than the normal proportion of oxygen; such an atmosphere is met with in elevated regions, and frequently causes distress in ascending a mountain.

Passive congestion of the lungs occurs in connection with chronic heart disease, in which the valves of the heart do not properly perform their functions, the blood regurgitates [crowds backward] into the lungs, and, as a result, passive or mechanical congestion of the lungs occurs. This form of congestion also is present in chronic diseases of the lungs, liver and kidneys which lead to obstruction in the return circulation.

Symptoms.—In congestion of the lungs, as in œdema of the lungs, there is difficult breathing and cough with expectoration; indeed, it is not always easy to distinguish between them. If the congestion is extensive, the difficulty of breathing is urgent, but in the majority of cases of passive congestion there will be little or no change in the respiration; the individual becomes accustomed to

slight difficulty of breathing, and suffers no special inconvenience, except after active physical exertion. Blood-stained watery expectoration is its only positive symptom, and it is the symptom which causes alarm.

An individual with chronic heart disease becomes accustomed to shortness of breath and to a certain degree of difficulty in breathing, but when he begins to expectorate (perhaps profusely) a blood-stained watery material, he will become more or less alarmed. There is sufficient cause for alarm, as extensive congestion of the lungs, either active or passive, is usually sudden in its development, rapid in its course, and, unless quickly recovered from, either destroys life in a few hours, or leads to inflammation of the lungs. In the majority of cases of chronic heart disease, if extensive congestion of the lungs occurs, it will probably destroy life. In such cases, whenever blood-stained watery expectoration appears, the danger should be fully appreciated.

Treatment.—This disease is always so grave in character as to require the immediate services of a physician. When the disease assumes a threatening aspect, the quantity of blood in the lungs should be lessened. To accomplish this, resort to dry or wet cupping over the entire chest [see Chapter on the Care of the Sick]; sometimes this result may be more readily obtained by bleeding from the arm. Steam inhalations are serviceable, and may be resorted to at any period of the attack.

Apoplexy of the Lungs.

Pulmonary Apoplexy and pulmonary congestion are very frequently associated with each other.

It is not necessary to devote much space to the consideration of this disease, for when it occurs, either a physician is in regular attendance upon the individual, or the symptoms are so alarming that his services are at once sought; or it may be that the apoplexy is so slight that there are no noticeable symptoms, except the expectoration of small blood-clots having a dark color.

Symptoms.—When the apoplexy is of considerable size, or a number of small apoplexies occur at once, very decided symptoms are developed; prominent among these is difficult breathing. For example, an individual has suffered for some time from chronic heart disease, he has become accustomed to the shortness of breath which accompanies the disease when, suddenly, he becomes aware that the difficulty of breathing from which he suffers is of a peculiar character, he feels as though some extensive damage had sud-

denly been done to his lungs; this sensation is immediately followed by a more or less free expectoration of dark blood.

Treatment.—The treatment of this disease must necessarily be under the direction of a physician.

Hemorrhage from the Lungs (*Hemoptysis*).

It has already been stated that the "spitting of blood" may occur in pulmonary congestion or apoplexy. It also attends some of the severer forms of inflammation of the lungs and bronchial tubes, but in the majority of instances it is due to hemorrhage from the vessels of the mucous membrane of the bronchial tubes.

Causes.—Bronchial hemorrhage is due to a weakness of the walls of the vessels of the bronchial mucous membrane. Such weakness may be a hereditary or an acquired condition. The tendency to bronchial hemorrhage from weakened capillaries is most marked between the ages of fourteen and thirty, especially in young and delicate persons born of consumptive parents. There is also a strong predisposition to this form of hemorrhage in persons who are suffering from developed consumption, or who have an acquired consumptive tendency. In such cases the direct cause of the hemorrhage is a sudden distention of the weakened bronchial capillary blood-vessels from violent physical exertion, or from certain peculiar atmospheric influences. In some instances it occurs without any appreciable cause. Occasionally, the congestion of the bronchial mucous membrane, occurring in that form of bronchial catarrh which often precedes the development of consumption, is the exciting cause of the hemorrhage. Hemorrhage from the bronchial mucous membrane may also be induced by the inhalation of irritating gases or vapors, and by the rarefied air of high elevations; in both these instances the hemorrhage follows over-distention of the capillary vessels of the bronchial mucous membrane.

Symptoms.—The symptoms which attend a hemorrhage from the bronchial tubes vary with the amount of hemorrhage. All bronchial hemorrhages are attended by the spitting of bright-red, frothy, arterial blood. If the quantity of blood is very small, this will be the only appreciable symptom. Rarely are the symptoms trivial which attend a bronchial hemorrhage, for, in most cases, it is profuse.

A very profuse bronchial hemorrhage may come on suddenly, but usually, previous to its occurrence, the individual has had a sense of constriction at the upper portion of the chest, and, upon

respiration, a sense of uneasiness which he was unable to account for ; he may or may not have had a cough preceding the hemorrhage. Suddenly, he feels as though some fluid had commenced trickling underneath the breast-bone, and he notices an unnatural sweetish taste ; he finds that this is due to blood in his mouth, although he may not have coughed immediately preceding the hemorrhage. Now, he feels more or less bronchial irritation, which is followed by cough and blood in expectoration, one mouthful following another in quick succession. The coughing continues, interrupted only by short intervals, and blood may be expectorated for several days, sometimes only for a few hours. The quantity of blood expectorated varies ; it may be no more than one or two ounces, or it may be from sixteen to twenty ounces.

The symptoms during an attack vary. Usually, as soon as the individual finds that he is expectorating blood, his countenance assumes a pale, anxious expression, he becomes tremulous and sometimes faints. These symptoms are not due to loss of blood, but are probably due to the shock given to the nervous system from the sight of blood, and the knowledge that a hemorrhage from the lungs is taking place. All these symptoms may be present when the individual has lost only a few ounces of blood. For a few days after a profuse hemorrhage, the coughing continues, and the individual expectorates small, dark, coagulated masses of blood, or blood-streaked sputa. Sometimes these hemorrhages are so profuse that the blood spurts out of the mouth and nose ; this is followed by nausea and vomiting of blood, and the nausea and blood-vomiting do not precede the bronchial hemorrhage, as would be the case did the blood come from the stomach.

A single attack of bronchial hemorrhage is of rare occurrence. For a week or two following the first attack, the bleeding will recur at intervals. The individual becomes pale and feeble ; gradually recovery takes place, and in a few weeks he may feel better than before the accident. This is the most favorable termination that can be hoped for, except in those cases in which the hemorrhage is comparatively insignificant. Attacks of hæmoptysis, however profuse, are generally recovered from, in spite of the extreme prostration and tendency to fainting which sometimes attends their occurrence. In the majority of cases there is no occasion for sudden alarm. When the recovery from the hemorrhage is delayed, inflammatory processes may develop in the lungs.

There are certain bleedings which may be mistaken for hemorrhage from the lungs. Bleeding from the nose has frequently been mistaken for it, but can readily be recognized, as the blood is of a

dark color and coagulates, and it can always be seen in the nostrils and back of the throat; besides the bleeding is not necessarily attended or followed by a cough. Blood vomited from the stomach is not unfrequently supposed to be a hemorrhage from the lungs, but when blood comes from the stomach it is clotted and dark colored, and the vomiting precedes the hemorrhage. If nausea and vomiting are present with hemorrhage from the lungs, they follow the spitting of red, frothy blood, and the bleeding is not accompanied by a cough. Frequently an individual, when he has a bronchial hemorrhage, thinks the blood comes from the throat, and consequently regards the bleeding as of no serious import. Rarely is hemorrhage from the throat profuse, and the bleeding parts can be readily seen upon examination.

It is the prevailing opinion that "spitting blood" indicates that a person has consumption. In many instances this is true, but in a large proportion of cases, consumption does not attend or follow its occurrence. Nevertheless it should be regarded with suspicion and a physician should at once be consulted. Rarely does it immediately endanger life, but in many instances it is the precursor of consumption.

Treatment.—In every case of bronchial hemorrhage the individual should be kept under the observation of a physician until all irritation produced by the hemorrhage has subsided.

The most important element of treatment is absolute rest in a cool room. The individual should be placed in bed and not allowed to sit up, turn over, or even speak above a whisper. If the cough continues and is constant, or induces the hemorrhage, it must be quieted by a full dose of opium; twenty-five drops of laudanum or one-fourth of a grain of morphine may be given for this purpose. There is no evidence that common salt has any controlling influence over the bleeding, but if an individual or his friend thinks it will be of service, there is no objection to its use. The application of ice-bags to the surface of the chest may be resorted to in extreme cases, but these applications must be cautiously made, and not continued a sufficient length of time to chill the individual. The eating of ice and the taking of cold drinks is of service.

These means are to be employed only until such time as the services of a physician can be obtained.

Gangrene of the Lungs.

This disease may only involve circumscribed spots in the lungs, it may be diffused through an entire lobe, or even an entire lung may be involved. The affected lung-tissue is more or less decom-

posed and converted into a putrid mass, which is saturated with a grayish black fluid.

Causes.—Gangrene of the lung occurs in connection with certain nervous diseases, such as dementia, softening of the brain, epilepsy, chronic alcoholism, etc. It is also met with when the system is in a depressed condition, the result of acute or chronic blood-poisoning. It may be the result of local disease of the lungs, such as obstruction in the blood-vessels leading to the gangrenous part.

Symptoms.—When gangrene of the lung commences, its symptoms are frequently very obscure. Those which most positively declare its existence are an exceedingly fetid breath and the expectoration of gangrenous material.

An exceedingly fetid breath is also present in fetid bronchitis, and in very many cases it will be difficult to distinguish the one disease from the other. In gangrene of the lung, the material expectorated is usually of a dirty black or brown color, and contains small black masses; by these it may be recognized.

In some cases the gangrenous process may continue for weeks before there are any constitutional symptoms, and when they are present there is nothing characteristic about them; they are merely those which indicate great exhaustion.

Recovery takes place only when the disease is small in amount and limited in extent. Death may be caused by hemorrhage, or by the extension of the gangrenous process to other organs, or by the exhaustion which attends the general poisoning of the system.

Treatment.—Sustain the individual in every possible way, by the administration of stimulants, tonics, and a most nutritious diet. Under the direction of a physician, antiseptic remedies may be employed, either by inhalation or in some other manner. For the most part the treatment must be palliative.

Cancer of the Lungs.

This is a disease seldom met with, and it is in most instances secondary to cancerous developments in other parts of the body.

Symptoms.—If difficult breathing, cough, hemorrhage from the lungs, pain in the chest, rapid emaciation, and a peculiar pale, dirty appearance of the skin should be present in one from whom a cancerous mass has been removed from some portion of the body by a surgical operation, there would be good reason to suspect the existence of cancer of the lung.

Treatment.—The treatment is restricted to relieving symptoms.

Opium may be given in sufficiently large doses to relieve pain, and to alleviate the distressing cough which attends its development.

If the disease is attended by hemorrhage, as is frequently the case, the same means may be resorted to to check the hemorrhage as would be employed in profuse bronchial hemorrhage.

This disease always proves fatal.

Pleurisy.

A partial or general inflammation of one or both pleura is termed pleurisy. There are three recognized varieties : Acute, sub-acute, and chronic—named from the course which the inflammation takes.

In *acute* pleurisy the symptoms are well defined ; its course is rapid and the exudation which results from the inflammation is principally fibrous.

Causation.—The cause of acute pleurisy is not always readily ascertained, exposure to wet and cold being regarded as one of the most frequent. I doubt if it occurs very frequently from this cause, unless some predisposing cause has previously existed, such as rheumatism, acute or chronic alcoholism, Bright's disease, or some other chronic disease of the viscera. It may occur as the result of a blow or some other injury to the side, or as the result of an extension of inflammation from some adjacent tissue, as when it is secondary to pneumonia, or to inflammation of the covering of the heart. It may occur at any age, but is more frequently met with in adults than in children.

Symptoms.—Acute pleurisy may be mild or severe, in either case it is ushered in by well-marked symptoms. At the onset a sharp, stitch-like pain is felt in some portion of the thoracic wall, increasing in severity from hour to hour, and is usually most marked under the nipple of the affected side. Each inspiration increases the pain, consequently the respirations become catching in character. To prevent motion of the affected side, the individual assumes a peculiar position, leaning forward and toward the affected side.

Neuralgic and muscular pains frequently affect the walls of the chest ; in some instances these are very severe, and are sometimes mistaken for pleurisy, but they are not accompanied by any febrile movement, and the one can readily be distinguished from the other. In the early stage of pleurisy, chills are not usually present. At first, the countenance is pale and anxious, after a few hours it becomes flushed. In a case of average severity the pulse

ranges between 90 and 120. The respiration is hurried and each inspiration is short and jerking in character. The temperature follows no regular course, rarely rising above 100° Fahr. in ordinary cases; occasionally I have seen it reach 104° Fahr. There is a constant hacking cough, either perfectly dry or accompanied by a moderate amount of thin mucous expectoration. Although there are few marked symptoms of acute pleurisy, yet these are such as direct attention to the seat of the disease.

If no grave disease complicates it within a few weeks after its commencement, the chances for complete recovery are good; if there is such complication, it may destroy the life of the patient.

Treatment.—The remedy which seems to have the greatest controlling influence in this disease is opium. It should be taken in sufficient quantity to relieve pain, say twenty drops of laudanum every two hours. The individual should be kept in bed in a room with a temperature of 67° Fahr. He should be allowed to assume the posture which he finds most comfortable, and should not be unnecessarily moved. An anodyne poultice, such as flaxseed and opium, should be applied to the affected side. The diet should be nutritious and non-stimulating. In mild cases, by the fourth or fifth day, the individual will be able to sit up and in two or three weeks can resume his ordinary business; but he must keep his room and avoid all physical exercise until he is free from all pain in the side and difficulty of breathing.

If a large amount of the inflammatory material be poured out upon the surfaces of the pleural membrane, the lung will be more or less crippled for a long time, and recovery will be followed by some retraction of the affected side which, for months after the acute stage of the disease has passed, will cause some difficulty of respiration. If there is great debility iron will be of service in the treatment.

Subacute Pleurisy.

This form of pleurisy is of much more frequent occurrence than is the acute, and may exist for weeks without any symptoms which will attract attention to the affected side.

In this disease the pleural cavity may be partially or completely filled with fluid, and the surface of the pleura be covered more or less extensively with a plastic exudation which may lead to extensive adhesions between the pleural surfaces, and thus bind the lung firmly to the chest-walls. In nearly every case, if the fluid effusion disappears, extensive adhesions take place between the lung and the chest-wall, which sometimes cause retraction of

the affected side to such an extent, that the liver and heart are crowded out of their normal position.

Causation.—Subacute pleurisy often depends upon the causes already mentioned as productive of acute pleurisy, although in a large proportion of cases it is secondary to some form of organic disease, as chronic Bright's disease of the kidney, consumption, etc. Not unfrequently, it is the first step towards the development of consumption. The weak and enfeebled, rather than the strong and robust, are subject to attacks of this form of pleurisy.

Symptoms.—Subacute pleurisy is frequently so insidious in its approach, that the individual is unable to tell when he commenced to be sick. For a period of five or six weeks he may not have

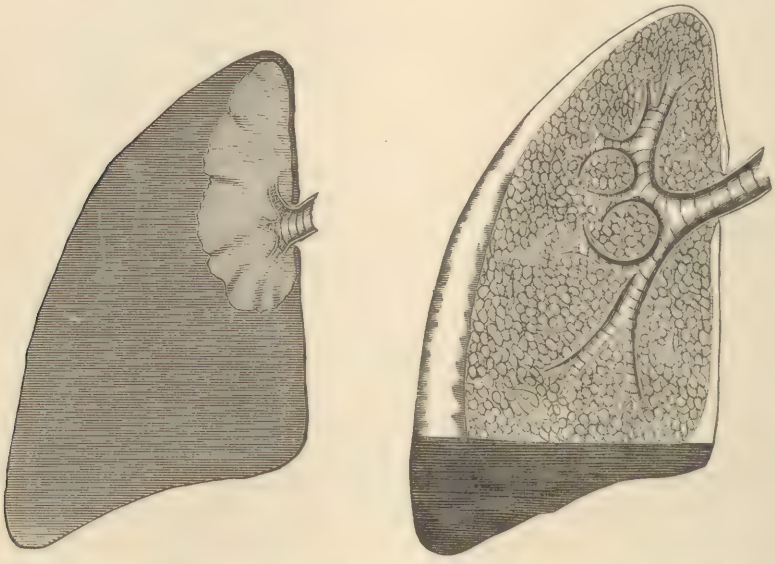

FIGURE 126.—Diagram showing a pleural cavity completely filled with fluid, and the lung compressed into a solid mass.

FIGURE 127.—Diagram showing roughening of the pleura from plastic exudation and a small quantity of fluid effusion in the bottom of the pleural cavity.

been feeling quite strong and well, but he had not been really ill nor confined to his bed at any time, and if his accustomed avocation required but little physical exertion, he may have attended to his daily business. He may have noticed that he was growing pale and losing flesh, and that upon physical exertion he had slight difficulty in breathing. He may also have noticed a slight febrile excitement at night, accompanied by dry hands and a sensation of thirst. He may have coughed, but the cough was accompanied by little or no expectoration.

These symptoms go on increasing, until the countenance assumes a pale, anxious expression. The breathing becomes short and catching in character. The individual is scarcely able to walk; when he attempts to speak, especially after moderate exercise, his sentences are uttered in a broken and interrupted manner. He is unable to lie down with any degree of comfort, except on his back, or on the affected side, with his head slightly elevated.

The presence of the above symptoms is strong presumptive evidence that the individual has subacute pleurisy, and medical assistance should be sought. When this disease is not associated with consumption, or any other form of acute or chronic affection, it usually terminates in recovery. If an individual has a hereditary or an acquired tendency to consumption, and the fluid is permitted to remain a long time in the pleural cavity, it not only causes permanent crippling of the lung, but, in many cases, it will lead to the development of consumption. The adhesions between the surfaces of the pleura may become the seat of tubercular developments.

Treatment.—The rapid removal of the fluid effusion from the pleural cavity, and the sustaining of the vital powers of the individual are the principal things to be accomplished.

Cathartics, diuretics, diaphoretics, and blisters applied in succession over different portions of the affected side, are the means usually employed for the removal of the fluid. Those persons who are the subjects of this disease, are usually in such a debilitated condition, that these means should never be resorted to without the advice of a physician.

In my own experience, I have found the remedial agent which has the greatest power in promoting the absorption of the fluid effusion to have been the iodide of iron.

Chronic Pleurisy—Empyema.

By this term is meant an inflammation of the pleural membrane in which pus is the product of the inflammatory action. The purulent accumulations may be so great as partially or completely to fill the pleural cavity, and death may result from the depression and exhaustion induced by the pressure. These accumulations may escape from the pleural cavity by spontaneous openings. The chest-wall may be perforated by an ulcerative process, and the pus be discharged externally; or the lung may be perforated, and the discharge take place through a bronchial

tube; or, in rare instances, the diaphragm may be perforated and the pus find its way into the abdominal cavity. If the individual survives the perforation and emptying of the pleural cavity, recovery is possible. Occasionally, pus in the pleural cavity undergoes absorption.

Causation.—The cause of chronic pleurisy cannot be ascertained in every case. It may originate in an injury. When it occurs spontaneously it is always associated with some vice of constitution, such as results from a protracted exhausting disease, or the debility which attends chronic alcoholism and follows enervating habits. Nearly all the pleurisies that are developed in advanced consumption are purulent in character.

Symptoms.—The symptoms of chronic pleurisy are obscure. The individual rarely suffers local pain, there is simply a sense of uneasiness or weight in the affected side. The invalid gradually loses flesh and strength, grows pale, and his countenance wears a peculiar, pale, anxious expression. There is an irregular daily fever preceded by a chill and followed by profuse sweating. His voice is weak, and ordinarily he has a cough with a not very abundant muco-purulent expectoration. As the disease advances, the patient gradually assumes the appearance of one in the last stages of consumption.

If an empyema is about to open externally, it will make itself manifest by the appearance of a protrusion between the ribs; this gives a sense of fluctuation to the touch; after a time the top of the elevation grows red, and finally an opening is made and pus is discharged.

Few recover from chronic pleurisy. Statistics show that of those in whom spontaneous openings occur, about one in five recovers, while of those in whom artificial openings are made about one in eight recovers.

Treatment.—In the treatment of this disease, it is useless to expect the purulent accumulation to be absorbed. Its removal can only be accomplished by the establishment of spontaneous openings, or by mechanical means. In either case the individual must be under the care of a physician for a long time.

Tonic remedies are of great service, and among these cod-liver oil and iron are the best, if the stomach will retain them without disturbance.

Those who suffer from this disease should be kept in the open air as much as possible, and a change of climate is often followed by a marked improvement.

Pneumo-hydrothorax.

As the name indicates, this is a condition characterized by the presence of air and fluid in the pleural cavity ; as soon as air enters this cavity it excites an inflammation of the pleural membrane which gives pus as its product.

Different views have been entertained in regard to the formation in, or entrance of pus into the pleural cavity. Some have claimed that pus is formed under these circumstances as a secretion ; others, that it is the product of decomposition of fluid in the cavity, whereas fluid in cavities with a lining membrane resists decomposition in a remarkable manner. Both views are highly improbable. There is little doubt but that in the majority, if not in all cases of pneumo-hydrothorax, there is an opening from the lung outward through a bronchial tube to the surface of the lung, or from the surface of the lung inward to a bronchial tube. In the one case the ulcerative process commences within the lung-tissue, in the other it commences upon the surface of the lung. In rare instances air enters the pleural cavity through an opening in the chest-walls by a wound or a fracture of the ribs, etc.

Symptoms.—In a few cases the symptoms which attend perforation of the lung, and the escape of air into the pleural cavity, are well marked ; the individual is suddenly seized with great difficulty of breathing, becomes blue, and rapidly passes into a condition of collapse. In the majority of cases, however, the symptoms are obscure and develop insidiously ; the difficult breathing comes on slowly, and is not attended by any active symptoms. Under such circumstances, the diseased condition can only be determined positively by a physician after a careful examination of the chest.

Very few recover from pneumo-hydrothorax. If perforation of the lung takes place in any stage, a fatal termination within a few weeks is almost a certainty.

Treatment.—The treatment of this affection is almost necessarily palliative. At the very onset of the attack, when the individual is suffering from the shock of the perforation, a full dose of laudanum [twenty-five to thirty drops to an adult] with stimulants may be given.

The further management of such a case requires the skill and judgment of a physician.

Inflammation of the Lungs (*Pneumonia*).

Pneumonia, or inflammation of the lung, is a disease which is grave in character and of frequent occurrence.

Strictly speaking, it is an inflammation of the vesicular structure of the lungs involving the intervesicular structure (the structure between the air-cells), the smaller bronchi, and the pleura.

Three varieties of pneumonia have been described by medical writers: 1*st*. *Croupous* or *lobar pneumonia*, which is always acute. 2*d*. *Catarrhal* or *lobular pneumonia*, which may be acute or chronic. 3*d*. *Interstitial pneumonia*, or fibrous induration of the lung-tissue. I shall consider these varieties separately, commencing with croupous or lobar pneumonia, and when the unqualified term pneumonia is used, reference is made to this variety.

Croupous or Lobar Pneumonia

Is one of the most common forms of acute disease met with in adult life. It occurs more frequently in males than in females, and between twenty and forty, and after sixty years of age, than during any other period, although no age is exempt.

This disease has received the name of lobar pneumonia because in nearly every case the whole of an affected lobe is involved; indeed the whole of one or a large portion of both lungs may be inflamed. It is sometimes called pleuro-pneumonia, for the reason that when the surface of the lung is involved, the pleura which covers that portion is also affected, but the pleurisy is secondary to the pneumonia. The term can only be properly employed when the pleurisy is the primary affection.

Croupous pneumonia has been divided into three stages: *First*, a stage of engorgement or congestion. *Second*, a stage of consolidation or red hepatization. *Third*, a stage of gray hepatization or resolution.

In the *first* stage, or stage of engorgement or congestion, the blood-vessels which surround the air-cells of the affected portion of the lung are distended with blood, and the air-cells and their cavities are more or less filled with a fluid material.

In the *second* stage, or stage of consolidation, the air-cells and the finest bronchial tubes become filled with a semi-solid inflammatory product, so that the affected lung-tissue is rendered solid, is impervious to air, and assumes a dark red color.

In the *third* stage, or stage of gray consolidation, the color of the affected lung-tissue is changed from a red to a gray color, the contents of the air-cells and the small bronchi become liquefied, and the liquid is either coughed up or absorbed. When this change goes on in a regular manner and is completed, the affected portion of lung is rapidly restored to its normal condition. If this resolving

process is interfered with, or if it never takes place, the affected lung-tissue may undergo a purulent change which will result in the destruction of that portion of lung or in the death of the individual. Death may occur at any stage of the disease, although it is more usual during the second or third stages. Death may take place as the result of sudden development of congestion and œdema in that portion of the lung which is not the seat of the pneumonic process.

Causes.—Poverty, intemperance, and occupations requiring exposure to sudden changes of temperature predispose to pneumonia. It is most frequently met with in climates subject to sudden variations of temperature. The weak and feeble, rather than the strong and vigorous, are especially liable to an attack ; as also are those convalescing from any grave form of disease. Previous attacks increase the liability to its occurrence. Unknown atmospheric conditions undoubtedly act as exciting causes, and epidemic pneumonia doubtless depends upon such conditions.

This disease also occurs in connection with chronic maladies of the blood, as chronic alcoholism, and it is evident that this variety of pneumonia is rarely a primary affection. Nearly every case can be traced to some well-recognized exciting or predisposing cause. For instance, a man who is a hard drinker (the alcohol taken having had its effect upon every organ in his body), sits in a draught, or in some way the surface of the body becomes chilled, pneumonia follows, yet the pneumonia is not a spontaneous disease.

Again, one may be charged with malarial, uræmic, or some other poison, and upon slight exposure pneumonia may be developed, yet the pneumonia is a secondary disease. These facts in reference to its causation have an important bearing as regards the means to be used for its prevention or in its treatment.

Symptoms.—Usually the invasion of acute pneumonia is sudden. It is ushered in by a distinct *chill*, which lasts from half an hour to two or three hours ; the intensity and constancy of the chill being greater than in any other disease, except malarial or septic fevers.

There are certain exceptions to this regular method of development which are worthy of special mention : In young children, pneumonia may be ushered in with convulsions, vomiting, and headache. Delirium may be a prominent symptom and cause attention to be directed to the head rather than to the lungs. When this disease occurs in persons more than seventy years of age, the chill is frequently absent. The pneumonia may come on insidiously, perhaps great prostration and stupor being the first noticeable symptoms.

When it is ushered in by a chill, in most cases there is afterwards pain underneath the nipple on the affected side. This is neither constant nor characteristic; usually, it subsides within three or four days. When it continues beyond the eighth day it may be regarded as evidence of pleuro-pneumonia.

The *respirations* are more markedly increased in frequency than in any other acute disease. They are rarely less than thirty, and often reach sixty to eighty per minute.

The *pulse* is not usually accelerated in proportion to the frequency of the respirations. It may remain at 100, while the respirations are as frequent as 60 or 80 per minute.

The *difficulty in breathing* does not seem to be in proportion to the amount of lung involved: often there is less difficulty in breathing when an entire lung is involved, than when a small portion of lung is affected. This is a most troublesome symptom in those individuals who suffer from great nervous prostration, and is always a grave symptom.

The *rise in temperature* is one of the most important and constant symptoms of this disease. In most cases it is sudden, and reaches 102° to 105° Fahr. In mild, uncomplicated cases, during the first week, it usually ranges from 102° to 104° Fahr. In fatal cases, and occasionally in those that recover, the temperature may reach 107° Fahr.

The first indication of convalescence is a fall in temperature; in ordinary cases this occurs on the fifth day. A high temperature after the tenth day is an unfavorable symptom.

Usually, the severity of a case can be determined by these three symptoms: the frequency of the pulse, the rapidity of the respirations, and the height of the temperature. If the temperature is above 104° Fahr., the pulse more than 120 per minute, and the respirations more than 40 per minute, the case must be regarded as a severe one.

In most cases *cough* is present. It usually comes on within a few hours after the accession of the disease. For the first twenty-four hours, if there is any expectoration, it is simply bronchial mucus. After this time the cough will be accompanied by an expectoration which is so peculiar that it has been called the characteristic expectoration of pneumonia. The material spat out is a semi-transparent, gelatinous, tenacious, viscid substance, which will adhere so closely to the walls of the vessel which may contain it that the latter may be inverted without displacing it. Its color varies; sometimes it is of a cream-yellow, again it is of a brick-dust or prune-juice hue; the latter color indicates that there is danger. If a case is tending to a fatal termination, the expectoration be-

comes scanty, less tenacious, and of a greenish color ; if recovery is to take place, it becomes profuse, and assumes a creamy appearance. In pneumonia occurring in connection with acute articular rheumatism, as also in the pneumonia of old people, expectoration is frequently absent. Pneumonia may run its entire course without recognition if attention is paid only to the cough and expectoration.

In the majority of cases, the aspect of the *countenance* is quite characteristic of the disease. It is more or less flushed and anxious, and assumes a dusky tint, in some cases approaching lividity ; this is usually circumscribed on the cheeks, and may be compared to color resembling mahogany.

Not unfrequently, early in the disease, little watery blisters make their appearance on the face and lips.

Head symptoms occurring in the early stage of this disease have no special significance ; in the latter stage they may be of very grave import. Headache may be present early, and continue throughout the entire progress of the malady. Delirium and convulsions rarely occur except in debilitated subjects and in persons of dissipated habits. Delirium is most frequently met with in connection with acute alcoholism when it assumes the character of delirium tremens. In children the head symptoms may resemble those attending inflammation of the brain.

Symptoms referable to the *digestive organs* are not very important. The tongue is usually covered with a creamy coating ; in severe cases it becomes brown and dry ; when recovery commences the tongue usually becomes clear and moist.

Loss of strength is present earlier and is more marked in pneumonia than in any other acute disease except typhus fever. Generally, the individual becomes very weak within four or five days. During convalescence, the recovery of strength and flesh is very rapid.

In most cases, acute, uncomplicated pneumonia runs a definite course : it is ushered in by a distinct chill ; this is followed by a rapid rise in temperature and an acceleration of pulse. The characteristic symptoms of the disease, which have been described, go on developing and increasing in severity until the critical day—the fifth or sixth after the chill. At this time a striking change takes place in the whole phenomena of the disease ; the pulse and temperature fall, sometimes gradually, at other times rapidly, the difficulty in breathing is not noticeable, and often within twenty-four hours convalescence is fully established. If the case does not pursue the regular course, that is, if the temperature remains high, or is higher after the sixth day than it has been at any previous

time, if the pulse becomes small and rapid, if great prostration comes on, and there is a tendency to stupor and delirium, if the tongue becomes brown and dry, it is evident that the disease is assuming a typhoid character; under such circumstances it is called *typhoid pneumonia.*

In the pneumonia of old people and persons of depraved constitution, typhoid symptoms may develop early in the disease, or they may be present at its commencement. Under such circumstances recovery is possible, but in the majority of instances the disease proves fatal. The age of the patient has more to do with the result than any other single element. Pneumonia almost invariably proves fatal when it occurs in a very young child, or in a very old person. The lowest rate of mortality is between the ages of ten and thirty. When an entire lung is involved the disease is more dangerous than when only one lobe is affected. Most cases terminate fatally when both lungs are attacked.

During some seasons, pneumonia is much more fatal than it is at others; probably this is due to the influence of certain atmospheric conditions not well understood. When pneumonia is developed in a person who has serious disease of any internal organ, it generally destroys life. There is special danger when it occurs during pregnancy.

Marked disturbance of the nervous system always indicates a serious form of the disease. Active delirium, coming on at the end of the first week in a person who has been addicted to the excessive use of alcoholic drinks, is always an indication of danger. In old persons, a tendency to stupor and tremulousness at any time during the progress of the disease indicates danger, as does extreme prostration when accompanied by a sunken pallid countenance, and followed by a cold and clammy perspiration.

Treatment.—The successful management of the disease depends not so much upon the treatment of the diseased lung as upon that which is directed to the constitutional condition of the patient. There is little doubt that a large number of cases of pneumonia would terminate in recovery if left entirely to good nursing and a nutritious diet. It is equally certain that many lives can be saved by judicious medical treatment, as also the duration of a mild form of the disease can be shortened and convalescence hastened.

To repeat what has already been mentioned, there are conditions and periods of life in which pneumonia is almost certain to terminate fatally, and on the other hand, there are other conditions and periods of life in which the disease is almost certain to terminate in recovery. The tendency of uncomplicated pneumonia is to terminate spontaneously in crisis between the fifth and seventh

day. Age, sex, certain constitutional conditions and atmospheric influences so modify the course of the disease, that, however mild the form, its treatment should never be undertaken without the aid of a physician.

My own observations have led me to this conclusion, that in order to intelligently treat the pneumonia we must take into account the circumstances and conditions under which the individual is placed. In the severer types of the disease, occurring in enfeebled subjects, there are two sources of danger—viz.: *high temperature* and *feeble heart-power;* the latter may have existed prior to the attack, or may have been developed during its progress. We should, therefore, aim to accomplish reduction of the temperature and sustaining the power of the heart. The means employed to accomplish these results can be safely used only under the immediate direction of a physician.

During convalescence from pneumonia, great care should be exercised that the nutrition is maintained, and that the surface of the body is not exposed to changes of temperature. If three or four weeks elapse after the subsidence of the acute symptoms, and the individual is still feeble, with more or less cough and expectoration, a change of climate and habits of life will be attended by the most markedly beneficial results.

It is all-important that the sick-room of any one suffering from pneumonia should be large and well ventilated ; its temperature should range from 68° to 70° Fahr. Great care should also be taken in regard to the diet. Absolute rest in a recumbent posture should be insisted upon ; he should not be allowed to get out of bed, neither should he be permitted to converse with friends. As in other acute diseases, as much, perhaps even more, depends upon careful and judicious nursing, as upon medicinal treatment.

Catarrhal Pneumonia.

Catarrhal pneumonia may be either acute or chronic. In its acute form, it is almost exclusively confined to childhood ; in its chronic form it bears a close relation to consumption. In most cases its development is preceded by or associated with capillary bronchitis ; the small bronchi leading to the inflamed lobules becoming more or less completely obstructed.

Acute catarrhal pneumonia, like acute croupous pneumonia, has three stages :

First.—The stage in which there is congestion and engorgement of the affected portion of lung.

Second.—The stage in which the affected portions are solid and impervious to air.

Third.—The stage in which the changes take place in the inflammatory material, which fills the air-cells and bronchial tubes, previous to its being coughed up or absorbed.

Causation.—It is essentially a disease of childhood, occurring between one and six years of age. It is especially liable to be developed in the bronchitis which attends whooping-cough, measles, diphtheria, and influenza.

Debility, inhalation of impure air, and a long-continued recumbent posture predispose to its development. When this disease occurs in the aged, in enfeebled adults, or in those suffering from acute infectious disease, it is generally of the chronic variety.

Symptoms.—In most cases this form of pneumonia is secondary to some other disease, it is therefore difficult to give a history of the phenomena which attend its development, as they are so frequently obscured by those of the disease which has preceded its development. If it occurs as a primary affection, these phenomena very closely resemble those which attend the development of croupous pneumonia. The symptoms which commonly attend its early stage may be the more readily appreciated if the history of its development is given in connection with that of the diseases with which it most frequently occurs. For instance, a child with an ordinary bronchial catarrh, or a bronchitis attending measles or whooping-cough, has a temperature ranging from 101° to 102° Fahr.; if acute catarrhal pneumonia be developed, it rises within a few hours to 104° Fahr. The pulse and respirations are immediately accelerated, the respirations which before were labored, now become panting, the countenance becomes flushed and anxious, the nostrils are distended, and there is great restlessness. The cough, which previously was loose, now becomes dry and hacking, and is attended with little expectoration; there is nothing characteristic about it, as in croupous pneumonia. The course of this form of pneumonia may be exceedingly acute and rapid, or it may be subacute in character, and run a slow, lingering course. When it runs an acute course, it may prove fatal in a few days; especially is this the case in feeble children.

The subacute form occurs in connection with the bronchitis of scrofulous children just recovering from measles or whooping-cough. In this form, the elevation of temperature is not so sudden, and the accession of all the pneumonic symptoms is more gradual. The child loses flesh, becomes pale, has profuse sweatings and fits of exhaustion, his appetite becomes capricious or is entirely lost, his face becomes bloated, and death occurs as the

result of progressive exhaustion. In some cases, after a prolonged illness, when, apparently, death must ensue, a slow, but complete recovery is made.

When catarrhal pneumonia occurs as a complication with measles it more frequently terminates fatally than when it occurs with whooping-cough. It is especially dangerous, when it occurs as a sequence to scarlet fever in which the kidneys are affected. The chances for recovery are always better in one who has no organic disease at the time of the attack. When the hygienic surroundings are bad, the chances for recovery are diminished. When the temperature is above 105° Fahr., it is regarded as a specially unfavorable symptom.

Treatment.—In the treatment of this form of pneumonia, it must be constantly borne in mind that it is a secondary affection, the child is already in a debilitated condition, and a supporting plan of treatment is indicated. In order to the successful management of this disease, it is of importance that the patient be kept in a well-ventilated room, with the temperature ranging between 65° and 70° Fahr. No sudden variations of temperature should be allowed. The body and extremities ought to be covered with flannel, and the child should be kept in bed until convalescence is fully established. During the entire course of the disease the food should be fluid, nutritious, and given in the most concentrated form. Great care must be exercised while the child is convalescing, all fatigue and exposure should be avoided, lest a fresh bronchial attack be induced.

Interstitial Pneumonia.

This form of pneumonia never occurs as a primary affection, and never runs a distinct course; even its existence can be detected only by a careful physical examination of the chest, and this must be made by a skilful physician. The diseased processes have their seat in the intercellular structure of the lung.

Symptoms.—The symptoms which attend its development are never well marked. There is no rise in temperature, nor acceleration of the pulse. Its existence is first indicated with any degree of positiveness by the retraction of the chest-walls over the affected portion of the lung. The constitutional symptoms are a gradual loss of flesh and strength, sometimes night-sweats; there is no fever. When this form of pneumonia is once fully developed, it is incurable. This disease will be more fully considered in connection with consumption.

Pulmonary Consumption—Phthisis Pulmonalis.

In this country there are more deaths from pulmonary consumption than from any other chronic disease. Its symptoms, such as progressive emaciation, cough, night-sweats, hectic flush, and diarrhœa, are so characteristic, and the duration of the disease is so protracted, that its existence is readily recognized by non-professional persons; at the same time, its occurrence is so common that nearly every person is familiar with its general features.

There is great diversity of opinion among medical men in regard to the exact nature of consumption. One class of observers maintain that the changes which take place in the lungs in consumption are inflammatory; another class hold the belief that they are due to the development and breaking down of tubercles in the lung-tissue. My own observations lead me to the opinion that these changes vary greatly in their nature in different cases, and that there are several varieties of consumption, which are marked by very different anatomical changes in the lung-tissue. I shall therefore describe the disease under three general heads:

1*st. Catarrhal Consumption.*

2*d. Fibrous Consumption.*

3*d. Tubercular Consumption.*

These different forms may occur separately, or they may all be developed in the same individual. Undoubtedly the most common form is that in which there is a union of the catarrhal and fibrous processes.

Catarrhal Consumption.

At the commencement of the disease, there is usually a catarrh of the lining membrane of the air passages, more particularly of the lining membrane of the bronchial tubes which ramify in the upper lobes of the lungs. We do not always know what causes this catarrh. It differs from every other bronchial catarrh, in its persistency and in its tendency to recur. It first invades the larger bronchi; from them it passes to bronchial tubes of smaller size until it reaches the most minute branches of the bronchial tree, which become so completely obstructed by the products of the inflammatory process, and by the changes in the wall of the bronchial tubes, that the passage of air to the air-cells beyond is entirely obstructed, and, as a result, the air-cells beyond the point of obstruction collapse. Following the collapse a peculiar form of

inflammation is set up in the closed lobules, which ends in consolidation and degenerative changes, leading, finally, to the formation of little cheesy masses. After two or three such attacks of bronchial catarrh and lobular consolidation a sufficient extent of lung-tissue becomes involved to lead to softening and the formation of cavities in the lung. The length of time which a cheesy nodule thus formed may remain unchanged in the lung depends partly upon its size, and partly upon the rapidity of its formation; the larger its size and the more rapid its formation, the greater the danger of softening and the formation of cavities. If the changes which take place in the cheesy masses progress slowly, fibrous tissue may be developed around them, and the destructive processes, for a time, will be arrested; but if the changes take place rapidly, but little fibrous tissue is developed and the destructive process goes on rapidly, so that the development of fibrous pneumonia in connection with the pathological processes of catarrhal consumption must be regarded as a conservative process.

Fibrous Consumption.

The development of an excess of connective-tissue which occurs in this form of consumption, may commence in the intercellular tissue around the blood-vessels, or extend into the lung-tissue from the pleura, or it may commence in the walls of the air-cells, and in the connective-tissue sheaths of the minute bronchial tubes. It may or may not be associated with chronic catarrhal pneumonia. Sometimes the pleura over the hardened lung-tissue is thickened half an inch. When this indurating process has existed for some time, the apex, and in some instances the whole of the lung is converted into a tough, fibrous tissue, all trace of normal lung being obliterated. Within this fibrous mass the bronchial tubes present various conditions: at one point their walls are thickened and their calibre diminished, while at another point, they are thinned and dilated.

Tubercular Consumption.

In lungs which are the seat of this form of consumption, there are found scattered more or less abundantly throughout its substance small, grayish, semi-transparent granules about the size of a millet-seed; sometimes the entire lung is studded with these little bodies which are called *tubercles*. These little granules may unite and form nodules of greater or less size. In the lung-tissue adjacent to these nodules, inflammation is usually set up. As the dis-

ease progresses these tubercles soften, break down, and cavities are formed in the lung substance.

Tubercles may be formed in the fibrous tissue of the bronchial tubes, in the wall of the blood-vessels, in the connective-tissue of the lung, and in the walls of the air-cells.

Causation.—Although consumption in its advanced stages must be regarded as an incurable disease, yet, with our present knowledge of its causes we may hope to be able to prevent its development in a large proportion of cases. Consequently the question of its causation becomes a very important element in its history.

The causes of consumption may be classed under two general heads.

1.—*The general causes.* 2.—*The local causes.*

Under the head of *general causes* I shall make three sub-divisions.

First.—Hereditary or acquired feebleness of constitution.

Second.—Anti-hygienic influences.

Third.—Climate.

Under the head of *local causes* are the following:

First, bronchitis. Second, pneumonia and pleurisy. Third, mechanical irritation.

These two sets of causes may be associated, or they may operate separately in the production of this disease.

Hereditary influences.—There is no question that certain hereditary influences have very much to do in preparing the way for the development of consumption. Some careful observers have maintained that consumption can never be developed in an individual who has no hereditary tendency to the disease. Every day's experience disproves this statement. On the other hand equally competent observers have maintained that consumption is hereditary in comparatively few cases; this statement is also contrary to the same experience.

The statement that hereditary influences cause consumption is better understood and appreciated, when we take the position that *it is not the consumption which is transmitted from parent to offspring, but a feebleness or vice of constitution*, which so affects the individual that consumption may readily be developed when he is subjected to certain local, exciting causes. Especially is this the case in the children of the aged, of drunkards, of those enervated by excesses of any kind, or those who at the time of the birth of their children were suffering from some form of constitutional disease, such as cancer, syphilis, rheumatism, etc. Therefore, in order to fully appreciate the influence of hereditary taint, it is ne-

cessary to know the physical condition of the parent at the time of the individual's birth.

Anti-hygienic influences.—So long as poverty and destitution, dissipation and enervating luxury shall exist, anti-hygienic influences must be regarded as next in importance to hereditary influences in the causation of consumption. Among these, are impure air, food of improper quality and in insufficient quantity, insufficient clothing, damp and badly-ventilated apartments, intemperance in the use of alcoholic stimulants, prolonged lactation, want of cleanliness, and all those influences which arrest or lessen the function of the skin.

It needs no argument to prove that the foundation for a strong and vigorous, or for a weak and feeble constitution, is to a great extent laid during the first two years of infantile life.

Let a healthy child during its infancy and early childhood live in small and badly-ventilated apartments, with improper diet, and all the attendant anti-hygienic influences by which the tenement-house population of great cities is surrounded, and it will become a feeble child; and though maturity may be reached, yet it will have stamped upon it such a vice of constitution, that consumption will be developed upon the least local exciting cause.

The opinion prevails that sooner or later consumption is certain to develop in those who have a strong hereditary predisposition to the disease; that because a father, mother, brother, or sister have died of consumption, the disease will develop in the other members of the same family. Whereas the antecedent hygienic influences under which the childhood or adult life has been passed have much more to do with the development of the disease than has the hereditary tendency.

How few infants are properly fed! How few mothers, especially among the wealthier class, are in a condition to properly nourish their offspring. The feeding of children until they are one, two, or even three years of age, upon barley-water, pap, sweetmeats, and indigestible articles of diet, has a most pernicious influence upon their future physical development, and if at the very entrance of adult life, some local inflammation of the lungs or bronchial tubes does not cause the development of consumption, the case will be an exception, and not the rule. The overcoming of such constitutional tendency should be aimed at in the physical training of such children during their infancy and childhood. In the majority of cases this can be accomplished before the age of puberty is reached. A mother who has a consumptive history should *never* be allowed to nurse her own children; they should be nursed by a vigorous non-consumptive wet-nurse.

All of these predisposing influences, both in childhood and adult life, produce the one result, viz.: the arrest of physical development, and thus the power of resistance is lessened, and the individual is in such a condition as to be readily acted upon by the local causes which lead to the development of consumption.

Climate.—It can hardly be said that there is any climate which prevents the development of consumption, or renders that development a necessity. There are, however, certain conditions of climate which favor its development, and there are likewise certain conditions which, to a certain extent, are antagonistic to its development. For example :—a damp, cold climate, depending upon certain conditions of soil, undoubtedly favors the development of consumption. On the other hand, consumption is rarely developed in a moderately high altitude ; therefore, to a certain extent, high elevation is antagonistic to its development. There can be little question but that consumption occurs much more frequently in one latitude than in another, for instance, it is of much more frequent occurrence in the temperate, than in the torrid or frigid zone.

Local Causes.—Under this head are included bronchitis, pneumonia, pleurisy, and mechanical irritants. That repeated attacks of bronchitis may terminate in consumption has long been known. It is a well-established fact, that a large proportion of the cases of consumption begin with a catarrh, which gradually extends from the larger into the finer bronchial tubes, and finally involves the air-cells of the lungs.

Why such catarrhs should lead to such results in one person and not in another, can readily be explained by referring to the general causes of consumption, to which allusion has already been made. When an individual is in a condition to resist an attack of bronchitis, it usually terminates speedily in complete recovery ; if any or all of the predisposing causes of consumption, which have been detailed, are in operation, the bronchial catarrh progresses and consumption is the result !

The development of this disease from catarrhal pneumonia has already been sufficiently considered. The frequency with which it follows an attack of pleurisy leaves little doubt but that pleuritic inflammation is a very frequent local exciting cause.

Mechanical irritation of the lining membrane of the respiratory passages produced by the constant inhalation of air laden with dust and noxious gases, very frequently is the exciting cause of consumption.

The causes of tubercular consumption are still undetermined. Many persons believe that the little tubercular granulations in the

lungs, which are the local cause of its development, are due to a specific infection.

Symptoms.—Each variety of consumption has a few prominent characteristic symptoms; to these I will briefly refer, and will then consider those symptoms which are common to all varieties.

Chronic Catarrhal Consumption.—This is the most common form, and generally begins as a common cold. No very active symptoms mark either its advent or development. After the cough has continued for some time, the expectoration becomes tenacious, and is now and then streaked with blood. The individual gradually loses flesh and strength; is constantly, as is said, "adding to his cold," until after a variable time, he begins to have fever and sweats, and becomes too feeble to continue his accustomed vocation, and is compelled to seek the advice of a physician. Occasionally, this variety of consumption is developed from acute catarrhal pneumonia; then its advent is marked by active symptoms.

Tubercular Consumption differs from catarrhal consumption in that the constitutional symptoms precede the local. Usually, for some time prior to the development of the local symptoms, the individual loses flesh and strength, has dyspeptic symptoms with complete loss of appetite, and more or less febrile disturbance. During this period the individual continues to go about, but constantly complains of physical weakness and an incapacity to do anything that requires mental application. At night there is more or less profuse sweating, and inability to sleep on account of a dry, hacking cough. A high range of temperature, rapid emaciation, and a dry, hacking-cough are the early and prominent symptoms of tubercular consumption.

Fibrous Consumption is distinguished from all the other forms by its great chronicity. It comes on obscurely, and it is characterized by the signs of bronchitis, or of pleurisy limited to one side. After cough and expectoration have existed for some time, the individual commences to lose flesh and strength, the cough increases, and the expectoration becomes more abundant. Gradually, the ordinary symptoms of consumption are developed, although at no time is there any very marked rise in temperature, or great acceleration of the pulse.

Increased *frequency* and *difficulty of respiration* is present in a greater or less degree in every variety of consumption. It is a marked symptom only after or during physical exertion; an individual, even in the advanced stage of the disease, may not suffer from difficult breathing while lying quietly in bed. Pain in the chest is neither a very prominent nor a constant symptom, except

in connection with pleuritic changes. Dry pleurisies occur often during the course of the disease, and they cause intermittent attacks of pain ; these are usually located under the "shoulder-blade."

Cough is usually present at the onset of the disease, and continues through its entire course. Usually, at first it is dry and paroxysmal, or hacking in character, and is attended by slight-expectoration; if the latter *is* present, it is small in quantity, tenacious in character, and gives the individual great trouble in its removal.

Many persons cough but little, except in the morning after rising. Others have paroxysms throughout the twenty-four hours, with intervals of rest. In advanced cases the intervals of rest are short. As the disease progresses the cough has a rattling sound, is more or less hollow, and when cavities are formed, it assumes a peculiar sepulchral tone.

Expectoration.—At first the expectoration may be composed of tenacious mucus. If fine yellow streaks are to be seen in it, it is an indication that the catarrh has extended into the fine bronchial tubes. If, with these yellow streaks, there are streaks of blood, it may be inferred that the inflammation has reached the lobules of the lung. When cavities are formed the expectoration changes ; then it appears in rounded masses of a grayish color, and when thrown into a cup, they remain separate. As the cavities increase in size, the rounded masses gradually disappear and purulent matter in large masses, with small masses of cheesy matter mingled with it, are spat up. The quantity of matter expectorated varies, and depends upon the extent of the bronchial catarrh, and the number and size of the cavities.

Fever.—A case of consumption is rarely seen, in which there is not a rise in temperature, and the variations which occur are very great. What is known as hectic fever may be present in each variety of consumption. The symptom by which it will be recognized is the "night-sweats."

Hectic fever has three stages: a cold, a hot, and a sweating stage. These do not necessarily follow each other with any regularity. Sometimes in the course of the day the individual will have a creeping, chilly sensation, or a distinct chill lasting from a half-hour to an hour ; then there will be felt some dryness of the surface ; perhaps, in a short time, the temperature will rise to 103° or 104° Fahr., and the fever will last a variable length of time, giving to the face that peculiar, brilliant hue, and to the cheeks that rose tint which is so characteristic and so well known. After a time the fever gradually subsides, and sometimes in the course of the night, perhaps towards morning, comes on the stage of sweating.

These night sweats are usually very profuse and very exhausting. Hectic fever may occur during any stage of consumption ; usually, it is present during the stage of softening and the formation of cavities, but it is not necessarily confined to that stage. If it occurs early in the disease, it is an indication of tubercular phthisis. After hectic fever has occurred, it sometimes disappears without any apparent cause.

Pulse.—The pulse is generally accelerated and corresponds to the variations in temperature. Any slight excitement will cause an increase in frequency of fifteen to twenty beats in a minute. In tubercular consumption it is accelerated for a greater length of time than in either of the other varieties. In fibrous consumption it rarely is more frequent than 100 beats per minute.

Emaciation is a very constant attendant of consumption, but it is not always progressive. In the chronic forms of the disease it is usually very slow, the individual will alternately lose and gain flesh. In tubercular consumption the emaciation is progressive and rapid. With the emaciation, the countenance assumes a peculiar pallor which is quite characteristic, and consumptives very early complain of great debility and loss of muscular power.

Disturbance of the digestion is a common attendant of consumption, and often in the early stages of the disease there is great repugnance to food.

Vomiting is frequently a troublesome symptom, and it is usually reflex in character—caused by violent coughing. It may be due to a catarrh of the stomach, which is a frequent attendant of this disease.

Diarrhœa.—Few consumptives escape diarrhœa. It may be due to irritation of the intestines produced by undigested food, or to ulceration of the intestinal mucous membrane, and it may come on during any stage of the disease. In some cases diarrhœa alternates with the hectic fever: one appearing as the other disappears. Unless it can readily be controlled it must always be regarded as an unfavorable symptom.

Hemoptysis, or "spitting blood," may occur in any stage or form of consumption. The quantity of blood expectorated varies ; there may be only a slight trace of blood, or the quantity expectorated may be increased to even more than a pint. It makes its appearance with coughing, and is to be distinguished from all other bleedings from this region by the arterial-red color of the blood and the presence of more or less air-bubbles, giving it a frothy appearance.

Bleeding from the lungs in the early stage of consumption may be profuse, but is rarely, if ever, dangerous or immediately fatal,

although in an advanced stage of consumption, it may be the direct cause of death. I have already considered the subject under the head of bronchial hemorrhage. [See page 426.]

Changes in the voice, which occur during the course of consumption, are due to inflammation affecting the upper part of the wind-pipe (or larynx). In advanced consumption this laryngitis sometimes gives rise to the most distressing symptoms, such as permanent loss of voice, burning pain in the upper part of the wind-pipe, and extreme difficulty of and pain during swallowing. Laryngeal complications are always unfavorable. [See page 396.]

Œdema or *swelling of the feet and legs* is always a grave symptom. Its occurrence usually indicates that a fatal issue is not far distant.

There is a general impression that an individual with consumption is doomed to die within a limited period. Undoubtedly a large majority of cases will terminate fatally, yet improvement is possible in all stages of this disease ; approximate recovery may take place in more than half the cases, and complete recovery is not infrequent. In each case the result depends very much upon the variety and stage of the disease. Cases of tubercular consumption are, as a rule, rapid in their development, and terminate fatally within a year. In the catarrhal variety, the condition of the individual at the time of the attack, the power of resisting the disease, and the stage of its development determines, to a great extent, the result of the case. In fibrous consumption, although complete recovery rarely takes place, the individual may live many years in comparative health. Complete recovery can be hoped for only in the catarrhal variety ; and in this variety only during its first stage. Many cases which seem to be recovering, suddenly assume an unfavorable aspect on account of the occurrence of some complication.

It should be remembered that a consumptive who has no symptoms which are immediately alarming, may suddenly develop an emphysema, a pneumo-thorax, a peritonitis, intestinal ulceration, a profuse hemorrhage, a capillary bronchitis, or an acute pneumonia, and thus rapidly pass into a condition of great danger.

Treatment.—One should be familiar with the causes which lead to the development of consumption, in order to properly understand what is required in its treatment. I have already stated that in a large proportion of cases, consumption is the result of a hereditary or an acquired vice of constitution. It is evident that it is of the greatest importance that this vice be removed, and thus the development of this disease be prevented. It is during the period when preventive measures can be employed, that we have

the greatest power in controlling or preventing the development of this disease.

To illustrate : suppose a person with a delicate constitution, with a tendency to consumption, either hereditary or acquired, begins to emaciate, to lose strength, and to furnish other evidences that there is a marked interference with the nutritive processes ; it is of the greatest importance that such an individual be *immediately* placed under those influences which favor the arrest of this defective nutrition, and which have a tendency to invigorate the system and thus counteract this morbid tendency.

If such a train of symptoms are developed in a person whose occupation or habits of life compel him to spend the greater part of his time within doors, his occupation and his sedentary habits must be changed. If an individual with such tendencies is living in a locality where he is subjected to depressing influences, a change of locality must be insisted upon.

All those influences which tend to produce congestion and catarrh of the bronchial tubes should be avoided. Individuals with consumptive tendencies should be careful not to breathe an atmosphere laden with dust or charged with unwholesome vapors ; nor should they engage in occupations which compel them to pass suddenly from an atmosphere of extreme heat to one of extreme cold, or from one of extreme cold to one of extreme heat. Remaining in a crowded room for a few hours and then going into a cold, raw air should be avoided, as all such exposure for one with consumptive tendencies is especially liable to lead to consumptive developments. All extreme physical exertion should be avoided, for such exertion may be the cause of pulmonary hemorrhage. The surface of the body should be protected with the greatest care ; flannel should be worn next the skin throughout the year. Persons with the tendencies described should sleep in large, well-ventilated apartments, and should engage in those pursuits which afford the greatest exposure to fresh air. Great care should be exercised in regard to the diet, which should be simple, of the most nutritious quality, and should be taken at regular intervals. The quantity of food taken should be limited only by the powers of digestion. Milk and cream are articles of diet especially adapted to this class of individuals.

Every catarrh, however slight, should be treated with the greatest care, and the treatment should be continued until all traces of the catarrh have disappeared. If the catarrh shall have reached the smallest bronchi, and the cough is persistent and accompanied by a tenacious expectoration, the necessity for its arrest or removal becomes imperative. A change of air is more certain to produce

this result than any other means which can be employed. If the individual lives in a mountainous region he should go to the seaside; if by the sea he should go to the mountains. The great object in the *preventive treatment* of consumption is to sustain the vital powers that the individual shall not become susceptible to the local causes of consumption.

Medicinal Treatment.—This relates solely to the management of consumption already developed. There are a few remedial agents which are extensively employed in the treatment of this disease, but there are *no specifics*. Prominent among these is *cod-liver oil*. At one time this agent was thought to cure consumption, but it is very doubtful whether it has any direct curative power over the disease. Its beneficial influence is probably due to the fact that it furnishes some element which is essential to the digestion and assimilation of certain nutritive constituents of the food; exactly what that element is, is not known. It always acts remedially with more certainty in young persons and in children than in the aged. As a rule, old persons are not very much benefited by its use. There are certain practical points relating to its administration worthy of mention.

If possible, it should be given in connection with some alkali, such as soda, lime, or magnesia. It should not be administered with stimulants, unless it cannot be taken in any other way. No special benefit is derived from the administration of large doses. A teaspoonful once or twice a day will produce decided beneficial results, and a tablespoonful three times a day is as large a quantity as can be taken with benefit. Most persons prefer to take it immediately after meals, others can take it best when ready to retire for the night.

The *inhalation* of medicinal substances, vapors, and gases, has been very generally tried in the treatment of consumption, but there is no evidence that these substances, vapors, or gases have any power to control or arrest the progress of the disease. In many instances such inhalations do harm by exciting inflammation of the bronchial mucous membrane. Experience is decidedly against their use.

Alcohol.—Experience does not sustain the opinion that alcohol has power to arrest consumptive developments. For a time, its daily use may mask the consumptive symptoms, and the individual, as well as his friends, may imagine that the progress of the disease is stayed, but a condition is soon reached when it is apparent that large doses do not arrest its progress. Alcohol is not of service, unless it increases the desire for food and assists in digestion, except, perhaps, in exceptional cases, when, from the influ-

ence of some depressing cause, there is a physical demand for it, as after extreme fatigue or prolonged exposure to cold. It is exceedingly unfortunate for consumptives to become addicted to the daily use of stimulants. Malt liquors and wines are usually more serviceable than spirituous liquors.

Cough Mixtures.—There is a universal demand for something to relieve the cough. All cough mixtures that afford relief contain some anodyne, usually opium. It should be borne in mind that the well-being of every consumptive depends upon his power of digesting and assimilating food; everything that interferes with this should be avoided. Cough mixtures may afford temporary relief from a distressing symptom, but they always interfere with the digestive functions, and consequently do harm. Their use should be delayed as long as possible, and they should only be used under the direction of a physician.

The treatment of the diarrhœa, the night sweats, and the hemorrhage all require the personal attendance of a medical adviser.

Climatic Treatment.—The question of climate is of great importance in the treatment of consumption, especially during its first stage, and it is only during this stage that any permanent arrest of its development can be expected. The individual peculiarities of each case of consumption will decide the question of locality. Let the consumptive invalid recall whether, when in health, he was most vigorous in warm or cold weather, in a damp or dry atmosphere, and his experience may be of service in his choice of locality.

Nearly every variety of climate can be found in our own country. Minnesota has a dry, cold climate. A dry, warm atmosphere, may be found in certain sections of California, and in the southern portion of Georgia. The Bermudas, some of the West India Islands, and the eastern portion of Florida have a warm, moist climate. To persons likely to be benefited by a cool and moderately moist climate, I know of no locality I can more heartily recommend than the Adirondack region in our own State.

Some consumptive invalids do better among the mountains, others on or by the sea. In whatever locality a person with consumption improves, there he should remain, so long as the improvement continues.

Physical exercise is another essential element in the treatment of consumption. It should never be carried to over-fatigue, and it should be in the open air, or in a well-ventilated room.

Peculiarities of Affections of the Respiratory Organs in Children.

In the preceding history of the diseases affecting the respiratory organs, general reference has been made to their occurrence in adults, yet their nature and course is essentially the same when they occur in children.

There are certain differences, some of which I will briefly notice. In children the nervous element greatly modifies the development and progress of all acute lung affections. In very young children the shock given to the nervous system by the onset of an acute bronchitis or pneumonia often causes convulsions. These are followed by brain symptoms, and, on this account, acute pulmonary affections are frequently mistaken for acute diseases of the brain.

The *Bronchitis* of children is usually preceded by catarrh of the larynx. The child appears to have taken cold; he is hoarse, and frequently has what is called "false croup," which, to a certain extent, is due to a spasm of the larynx. In the adult no such croupy symptoms are present in the early stage of a bronchitis.* Simple bronchitis more frequently extends to the small tubes in children than in adults, and is, therefore, much more dangerous.

Spasmodic Asthma, in children, is always hereditary. I have seen a fully developed asthmatic paroxysm in a child three weeks old, born of an asthmatic mother. Atmospheric conditions seem to have little or no influence in developing asthmatic paroxysms in children, while in adults their effect is marked.

Congestion of the Lungs in children is most frequently associated with the eruptive fevers, such as scarlet fever and measles; while in adults it occurs most frequently in connection with heart diseases.

Dropsy of the Lung—Pulmonary Œdema, or the passage of a watery fluid from the blood-vessels into the lung-tissue, and into the cavities of the air-cells, occurs much less frequently in children than in adults. In adults it often complicates acute pulmonary diseases, and is a frequent cause of death, while in children this rarely occurs, but it is occasionally met with in connection with diseases which obstruct the passage of air through the larynx.

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*[The larynx of a young child is relatively smaller than in an adult, and therefore, when the mucous membrane lining it becomes over-filled with blood and swollen, the space is considerably narrowed, and a croupy cough is apt to be produced.—Ed.]

Collapse of the Air-Cells—Atelectasis.

This disease is frequently met with in children, rarely in adults. It is a condition in which there is imperfect or entire absence of expansion of the lungs. Before birth this is the natural condition of the lungs, but if it continues after birth it becomes morbid and is then known as *congenital atelectasis.* It sometimes occurs that a portion of lung which has been perfectly expanded loses its capacity for air, and collapses. This may take place as the result of complete obstruction of a bronchial tube, or as the result of external pressure, such as arises from tumors, rickets of the bones of the chest, or fluid accumulation in the chest, and is then called *acquired atelectasis. Congenital atelectasis* is the most common form. A circumscribed atelectasis is frequently met with in pneumonia of the lobules of the lung.

Symptoms.—When atelectasis involves only a small portion of lung, it does not give rise to symptoms. When large portions of a lung are involved, the breathing is superficial and rapid, the chest does not expand well, the ends of the fingers and the face are bluish, the voice is weak, nursing is imperfectly performed, and the surface of the body is paler and cooler than natural. Children in this condition are unusually inclined to sleep, and do not cry. In the new-born infant, if the atelectasis is extensive, it usually terminates fatally within a few days after birth. Occasionally life is prolonged two or three weeks ; then the child dies with all the symptoms of suffocation or in convulsions.

In cases of slight congenital atelectasis, if the child is otherwise healthy, with favorable surroundings, the prospect of recovery is good. If the atelectasis is acquired, the prospect of ultimate recovery depends upon the condition causing it, and if that is removed entirely and rapidly (as, perhaps, it may be in fluid accumulations in the chest), the recovery will probably be complete.

Treatment.—As atelectasis is more liable to occur in children whose bronchial tubes are partially or completely stopped by mucus or other substances, it is of the utmost importance that the mouth be thoroughly cleaned immediately after birth and that then the child be made to cry. Crying necessitates a preceding deep inspiration, and what is most needed is perfect expansion of every portion of the lungs. It is also important that those children be warmly clothed and kept thoroughly dry. The object is to protect them as far as possible from the danger of a catarrh.

If the child is unable to nurse properly, it must be fed artificially. The skin must be kept in a healthy condition, which can

be done by regular bathing with warm water. Respiration can be stimulated by irritating the skin, as by tickling the nose, or the soles of the feet, or by sprinkling with cold water. The strength of the child must be sustained by nourishing food, and, if necessary, by medicine and stimulants.

In congenital atelectasis the condition of the child will be noticed soon after birth, and a physician's aid should be sought.

Pleurisy.

Pleurisy in children is usually of the suppurative variety; the product of the inflammatory process is chiefly pus ; in adults the inflammatory product is usually fibrin and serum. For this reason pleurisy is a much more grave disease in the child than in the adult. Children with pleurisy usually complain of pain in the abdomen rather than in the affected side.

Pulmonary Consumption.

Pulmonary consumption in children, in the majority of cases, is of the catarrhal variety. Tubercular consumption rarely occurs in children unless there is general tuberculosis.

Inflammation of the Lung.

[A peculiar form of inflammation of the lung is apt to occur in very young infants who are either feeble from their birth, or who have become so in consequence of some severe and acute disease. When such children are allowed to lie too long in one position, it is found that, owing to the weak action of the heart, the blood stagnates in the lowermost portions of the body, and especially in the lungs, and it is not uncommon for the congestion thus produced to develop into a condition closely resembling pneumonia.

When this condition is added to the one previously existing, the chances for recovery are very much lessened. Care should always be taken, therefore, that children who are in this feeble state shall not lie too long without being turned over, or even taken in the arms, unless there are reasons for the contrary.

The form of pneumonia common to adults, and called *croupous pneumonia*, is not often seen during the period of infancy. The kind which is most often met with is of a catarrhal nature, and instead of involving one or more of the anatomical divisions of the lungs—called *lobes*—it is confined to the *lobules* or smaller divisions comprising a group of air-cells. A number of these

lobules may be the seat of the disease, and they may either be close together, in which case a considerable mass of lung-tissue may be rendered solid, or they may be scattered about in a portion of the lung substance.

Treatment.—None but a physician can detect the existence of these conditions, and it will be useless to mention any treatment beyond saying that a pure, warm air, kept moist by the presence of a vessel of boiling water in the room, favors the expulsion of mucus from the air-tubes. The chest may be entirely enveloped —front, sides, and rear—in a flax-seed-meal poultice, to which ground mustard has been added in the proportion of one part of the latter to fifteen of the former.

In *little* children an emetic of syrup of ipecac (a teaspoonful in water) will oftentimes bring away mucus that has collected in the larger air-tubes when the little patient fails to expel it by coughing, as older children would do.

If the infant is weak, its pulse feeble, and its surface cool, stimulants are essential ; and for this purpose brandy may be given to a child one year old, in doses of twenty drops, in sweetened water, every hour.

When an infant suffering with any trouble of the lungs or air-passages, is restless, has dusky lips and finger-ends, and when the openings of the nose are seen to enlarge with each inspiration, it is suffering for want of air, and no time should be lost in securing the services of a physician. Pending his arrival the treatment above recommended may be pursued.—ED.]

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The Kidneys in Health and Disease.

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THE KIDNEYS IN HEALTH AND DISEASE.

THE kidneys, two in number, are situated deep in the abdominal cavity, one on either side of the spine, between the eleventh rib and the crest of the hip-bone; the right kidney being somewhat lower than the left, probably in consequence of its nearness to the liver. In the adult male the average dimensions of the organ are: length, 4 inches; breadth, 2½ inches; thickness, 1¼ inches; average weight, 5½ ounces. The size and weight are both somewhat less in women, and its form is like that of the kidney of most domestic animals.

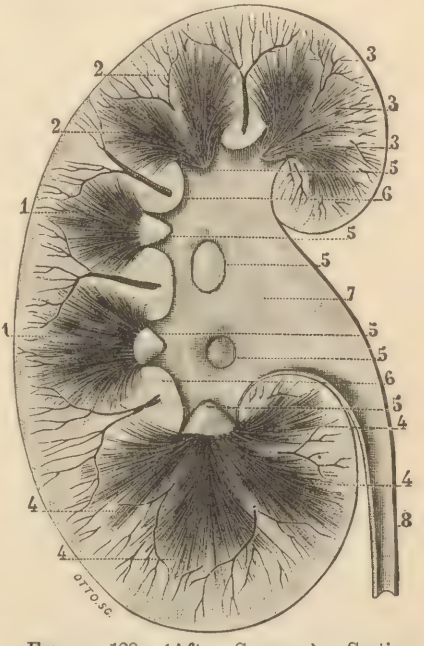

FIGURE 128. (After SAPPEY.) — Section through a kidney. 1, 2, 3, 4, Pyramids of different degrees of complexity. 5. Papilla opening into the pelvis of the kidney. 6. Portions of the cortical substance intervening between the pyramids. 7. Pelvis of the kidney. 8. Commencement of the ureter.

The fundamental structure of the kidneys is the same in all orders of the animal kingdom which are provided with a urinary apparatus, and consists of a system of blood-vessels and uriniferous canals, so related to each other as to favor the escape, from the former into the latter, of the surplus water and certain effete matters of the body. In insects and spiders the urinary apparatus is composed simply of long, delicate tubes, or groups of round vesicles, opening into a common canal, the dilated extremity of which forms the bladder. In the vertebrata—fishes, reptiles, birds, and mammals—the kidney presents a gradually increasing complexity of structure, but retains, in all, its character as an aggregation of distinct glands.

On laying open the human kidney by a longitudinal section the cut surface is seen to consist of two different portions : an external or *cortical*, and an internal or *medullary* substance (Fig. 128). The cortical substance, which constitutes about three-fourths of the gland, forms an outer rim about two lines (—) in diameter, and dips down between the pyramids of which the medullary substance is composed. The dotted granular appearance of the cortical substance is due to prominent *Malpighian corpuscles*, which, as we shall see later, play an important part in the secretion of urine. The medullary substance consists of from eight to eighteen *pyramids*, the bases of which are directed towards the cortical substance, and the apices (or points) towards the cavity occupying the interior of the organ. The pyramids are distinctly striated, owing to the mainly longitudinal direction of the blood-vessels and uriniferous tubes. At the points of the pyramids (*papillæ*) the uriniferous tubes discharge the urine into the cavity known as the *pelvis* of the kidney. Each pyramid, with its investment of cortical substance, represents one of the separate lobules seen in the kidneys of most of the lower animals, and in the human kidney itself during its fœtal stage of development.

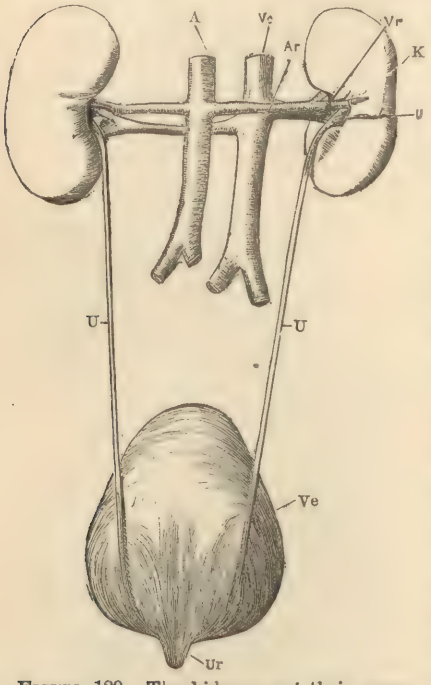

FIGURE 129.—The kidneys and their appendages. *A.* The large artery of the abdomen. *Ve.* The large vein returning blood to the heart from the lower portion of the body. *Ar.* The artery supplying the left kidney. *Vr.* The left renal vein. *K.* The kidney. *U.* The ureter. *Ve.* The bladder. *Ur.* The commencement of the urethra.

Minute Anatomy. — *Blood-vessels.* Each kidney is supplied by a large branch of the abdominal aorta, viz.—the renal artery. This artery enters the organ at the fissure on its concave border, and there divides into branches, which pass inwards on the outside of the pyramids, forming arches over the bases of the latter. From these arches are given off the *interlobular arteries*, which proceed directly into the cortical substance and there distribute *afferent* vessels, each of which passes to a *Malpighian body* (Fig. 130). On entering the Malpighian body, the capsule of which is formed by the dilated extremity of a uriniferous tube, the

afferent vessel breaks up into a tuft of capillaries, which are gathered together again to form the *efferent* vessel. This escapes from the capsule, alongside of the afferent vessel, and in its turn divides into capillaries, which surround the uriniferous tube in its further course. Since the total capacity of the capillaries in the Malpighian tuft far exceeds that of the afferent vessel, the current of blood becomes much retarded at this point; and as a sluggish current favors the escape of the watery portions of the blood through the walls of the vessels, it is probable that most, if not all, of the watery portion of the urine is separated in this part of the tube. The tuft probably fulfils, also, another function, viz., that of a "breakwater" against the sudden congestions to which the kidney is exposed even in health, and which, without some such provision, would be apt to rupture the delicate vessels surrounding the uriniferous tubes. Lying loosely within its capsule, the tuft readily expands under pressure from behind, and may thus serve as a "governor" to the current beyond. The solid portions of the urine are separated by a special apparatus lining the uriniferous tubes.

FIGURE 130. (After GRAY.) — The Malpighian tuft with the commencement of an uriniferous tubule and its blood-vessels.

Uriniferous tubes.—Beginning with the capsule of the Malpighian tuft in the cortical substance, the uriniferous tube, after forming several convolutions, descends directly into the adjoining pyramid, where it turns upon itself, forming a *loop*, and then reascends to the cortical substance (Figs. 130, 131). Here it empties into a *collecting tube*, which, starting just underneath the outer surface of the kidney, runs directly downwards, collecting on its way tubules from neighboring Malpighian bodies, and finally empties upon the papillary extremity of a pyramid. Throughout its entire extent, until it nearly reaches the papilla, the canal is lined with a layer of cells (*epithelium*). Many of these cells, especially those in the convoluted portion of the tubes, closely resemble the secreting cells of other glandular organs, and are therefore supposed to separate from the blood the solid ingredients of the urine.

Ureters.—From the kidneys the urine is conducted to the bladder by two tubes called ureters, from fourteen to sixteen inches in length, and of about the size of a goose-quill. Each ureter begins in the pelvis of the corresponding kidney, descends alongside of the spine, and on reaching the base of the bladder passes through its coats obliquely, opening upon the interior of the organ by a

narrow slit-like aperture, which acts as a valve, allowing the escape of urine from the ureter into the bladder, but preventing, under ordinary circumstances, a flow in the opposite direction. The narrowest portion of the ureter is that included within the coats of the bladder; hence the pain occasioned by the passage of a stone from the kidney to the bladder is usually most intense just before the final relief is afforded.

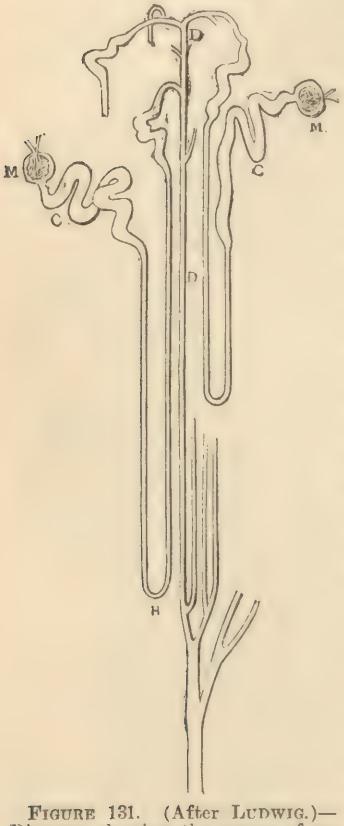

FIGURE 131. (After LUDWIG.)—Diagram showing the course of an uriniferous tubule, from the human kidney. *M.* Capsule of the Malpighian tuft, which is continuous by its neck with the convoluted portion of the canal (*C*). *H.* Henle's loop—composed of a descending and an ascending portion. *D.* Collecting tube.

THE URINE.

Color.—Normal urine receives its color from the presence of a coloring matter called *uro-hæmatin*, which is derived from the coloring matter of the blood. According to the degree of concentration or dilution of the urine, the uro-hæmatin produces several shades of color, varying from a very pale straw-color to a brownish yellow. In disease the urine may be absolutely colorless—as in attacks of hysteria; or may present deep red, olive, blue, green, or black hues.

A *deep red* color is seen when there is fever, and is then produced by a modification of the normal coloring matter, known as uro-erythrin. The *olive* color occurs in jaundice, and is due to the admixture of bile. When bile is present in large amount the urine has an olive yellow or olive brown color, which is best seen by tilting the fluid to the side of the chamber vessel. On shaking some of the urine in a bottle the foam is deep yellow. This olive-yellow color is produced by the coloring matter of the bile (*biliverdin*), the same substance that occasions the yellow hue of the skin in jaundice. To detect biliverdin with certainty, pour a few drops of the urine on a plate or saucer, and add one drop of strong nitric acid. If bile is present a characteristic play of colors is produced, beginning with green and passing through olive, violet, blue, and red to yellow. The green color is essential

to the test, as the other shades may be produced with other substances besides bile.

Blue and *green* colors in the urine are of rare occurrence. They are never present when the urine is voided, but develop only after the urine has been exposed to the air for some time, or has been treated with an oxidizing agent, such as a mineral acid. Their significance is not well understood ; they are sometimes noticed in the urine of Bright's disease and organic affections of the liver, but may also occur without any apparent disturbance of health.

A *deep brown* or *black* color varies in significance according as the urine is dark-colored when passed, or becomes so only after exposure to the air. In the former case the color depends upon the presence of altered coloring matter of the blood and broken down blood-corpuscles. This appearance of the urine in malignant typhoid and other fevers is usually a fatal omen, because it indicates a rapid dissolution of the blood. As a less serious symptom it occurs also in scurvy, purpura, and a singular affection called intermittent hæmatinuria (see p. 493). A dark brown or black color, which does not develop until some time after the urine has been voided, may be caused either by oxidation of the normal coloring matter (as occasionally happens in urine containing albumen), or by *melanine*, a coloring matter derived from melanotic (black) cancer in some part of the body.

It should be borne in mind that the abnormal colors may be produced in the urine by *medicines* as well as by disease. Thus rhubarb, santonine, and gamboge color the urine *yellow ;* senna *brown ;* turpentine, *violet ;* and creosote and carbolic acid *black.*

Odor.—Immediately after its discharge healthy urine has a characteristic, faintly aromatic odor, due to certain volatile organic acids. Abnormal odors are produced by certain articles of food (asparagus, garlic), and by certain medicines (copaiba, cubebs, turpentine). The urine in diabetes, when fresh, smells like new hay or ripe apples ; after fermentation, on standing for some time, like sour milk. In some cases of dyspepsia the urine smells like raw meat or decaying fish—probably from the presence of butyric acid. In inflammation of the bladder a pungent odor is sometimes developed in the urine by the decomposition of urea into carbonate of ammonia. In animals, the cat, horse, cow, etc., the odor of the urine is characteristic of the species, and is said to resemble the odor of the fat of the animal ; the urine of sheep, for instance, smelling like mutton suet.

Reaction (acidity or alkalinity) of the urine.—The reaction is most readily tested by the change of color which the urine pro-

duces in strips of blue and red litmus papers. The blue paper is prepared by dipping white unsized paper into an infusion of *litmus*, a blue coloring matter, derived from certain lichens. For the preparation of the red paper, the infusion of litmus is reddened by the addition of a small amount of acid. As blue litmus is *reddened by acids*, and *reddened litmus is restored to a blue color by alkalies*, the blue paper tests the acidity, and the red paper the alkalescence of the urine. Healthy urine, when passed at ordinary intervals, has an acid reaction; if *hourly* specimens be obtained, the reaction is found to vary at different times of the day. Within an hour after each meal the urine becomes alkaline, and remains so for one or two hours, after which it again becomes acid. This *alkaline tide* seems to be due partly to the withdrawal of acids from the blood to the stomach during the process of digestion, and partly to the absorption of alkalies from the food. When the urine, however, is discharged at the usual intervals, it remains continuously acid, because the effect of the alkaline tide is counteracted by the acid urine met with in the bladder. Temporary deviations from the normal reaction may be occasioned by various articles of diet, medicines, cold bathing, etc., and are usually entirely unimportant; but an *habitual* disposition, either to excessive acidity, or to alkalescence of the urine, is always a sign of ill-health, and by causing the precipitation of certain substances, which are soluble in urine of a proper degree of acidity, not infrequently gives rise to the formation of stone in the kidney or bladder. In the case of habitual excessive acidity, this danger arises from the deposition of *uric acid* crystals, of which gravel and stone are most frequently composed (see p. 472). The significance of alkaline urine depends entirely upon its cause, which may be either *fixed* alkali (potash, soda), or *volatile* alkali (ammonia). The distinction is extremely important, because the two varieties of alkalinity point to widely different morbid conditions, and consequently require different treatment. They may be readily distinguished by their different reactions to litmus paper. Fixed alkali restores a blue color to reddened litmus paper *permanently*, whereas, the blue color produced by volatile alkali disappears by evaporation on exposure to air, or the application of heat. Habitual alkalescence from *fixed* alkali is only very rarely connected with the formation of stone. It points rather to derangements in the digestive and nervous systems, and requires therefore to be treated by attention to the general health, out-door exercise if possible, the administration of tonics, etc. Habitual alkalescence from *volatile* alkali, on the other hand, points to ammoniacal decomposition of the urine, a condition rarely seen except in connection with inflammation of

the urinary passages, particularly the bladder, and consequently requires *local*, as well as general treatment.

Quantity.—The daily quantity of urine ordinarily passed in health, varies from thirty to sixty ounces (one to two quarts), and is regulated by a number of physiological conditions. Among these may be mentioned: 1. *The quantity of liquids drank;* 2. *The nature of the food*, a vegetable diet causing a greater formation of urine than animal food; 3. The amount of water discharged by the *bowels;* 4. The amount of water escaping in the *breath* and *perspiration.* Active perspiration materially diminishes the secretion, hence much more urine is passed in winter than in summer. The flow is more abundant also in a moist than in a dry atmosphere, since moisture of the air diminishes the amount of vapor given off by the lungs. 5. The influence of *age* and *sex.* Children pass more urine in proportion to their size than adults, and men pass larger quantities than women. The influence of various diseases will be considered later.

Density or *specific gravity* of the urine.—This is commonly tested by the *urinometer*, an instrument composed of a graduated stem, a blown glass float, and a bulb loaded with mercury, or lead, at its lower extremity. The stem is graduated from 1000 (the level to which the instrument sinks in distilled water) to 1040 or 1060. Urinometers with very short stems are objectionable, as the graduations are so close to each other that mistakes of several degrees are readily made. In reading the registration, the top of the fluid should be brought to a level with the eye; unless this is done, an optical illusion is produced by which the registration appears to be higher or lower than it actually is. Important indications of disease are often afforded by the specific gravity of the urine, since the latter represents approximately the amount of solid ingredients, but as a means of diagnosis it requires to be used with great caution. Single observations are valueless. The entire urine for the twenty-four hours must be tested; or, when this is impracticable, the first urine passed on rising in the morning may be used, as this usually represents the average daily specific gravity. These examinations should be frequently repeated to afford any reliable indication. In health the density generally ranges from 1.015 to 1.025, but may exceed or fall below these limits *tempora-*

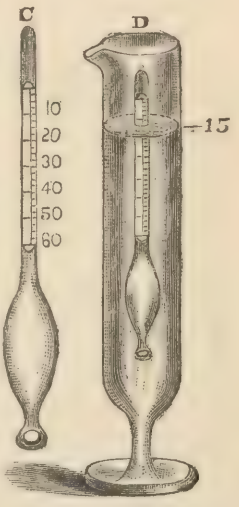

FIGURE 132.—Urinometer.

rily from accidental causes; active exercise, copious drinking, prolonged fasting, etc. A *permanent* daily average below 1.008, in connection with a copious flow of urine, points to *insipid diabetes;* a constant range between 1.008 and 1.015 commonly points to *chronic Bright's disease*, while a persistent elevation above 1.030 usually belongs to *saccharine diabetes.* Still these ranges are by no means distinctive, and are reliable guides only when taken in connection with other symptoms to be described later.

Temperature.—The burning or scalding sensation sometimes felt in the urinary passages during the escape of urine, is often supposed to be due to a heated state of the secretion. As the urine derives its heat entirely from the body, its temperature can obviously never exceed that of the channel through which it flows. The sensation referred to is in fact always due either to an acrid condition of the urine, or to morbid irritability of the passage itself.

Composition.—Besides water, the urine contains numerous solid ingredients: urea, uric acid, hippuric acid, creatine, creatinine; hydrochloric, sulphuric, and phosphoric acids, in combination with soda, potash, lime, and magnesia; xanthine, hypoxanthine, sarcine, coloring matter, mucus, and traces of other less important substances. Of the above constituents, *urea* is by far the most important, and nearly equals in amount all the others combined. This crystalline nitrogenous substance forms the final product into which nearly all the nitrogenous food and waste material derived from the disintegration of the tissues are converted prior to their expulsion from the body. In health, nearly nine-tenths of the nitrogen entering the body in the food ultimately escapes through the kidneys, only about one-tenth being removed by the bowels, and merely a trace by the lungs and skin. As almost all the nitrogen discharged in the urine is represented by urea, it is clear that this substance must play a very important part in the process of nutrition, and that serious danger to health must arise from failure of the kidneys to properly excrete it. The symptoms induced by its retention in the blood are seen in the form of blood-poisoning known as *uræmia*, and will be considered under the head of Bright's Disease.

The average amount of urea excreted daily in health is about 500 grains, or 3½ grains to each pound weight of the individual. In children, as might be expected from the marked activity of the vital processes in early life, the excretion of urea is proportionately greater than in adults, and for a similar reason is greater in mature than in advanced life. The chief physiological conditions, which regulate the excretion are the *amount* and *nature* of the food. Animal food increases the amount of urea to be excreted, while a

vegetable diet diminishes it; hence the great importance of caution in the use of much animal food whenever the function of the kidneys is seriously impaired—for instance, during convalescence from dropsy following scarlet fever, as well as in all other forms of Bright's disease. Owing to its ready solubility, *urea never forms a deposit in the urine.*

Deposits in the Urine.

After standing for a few hours in a glass vessel, even healthy urine presents a *light* cloudy sediment floating at a higher or lower level in the fluid. This fact is often taken advantage of by quacks to convince their dupes of the existence of serious disease. The deposit is composed simply of epithelial cells and particles of pigment, which are constantly shed by the urinary passages in health. When this shedding is excessive, as is often the case after an irritation of these parts, strings or flakes may appear in the urine, and excite much unnecessary anxiety. The appearance is usually entirely unimportant, and disappears after a time spontaneously. In abnormal states of the urine other substances are deposited, of which the most important are the following:

Urates.

The turbid appearance produced by a collection of this sediment is more noticeable, and more frequently excites alarm, than any other deposit which occurs in the urine. *It is readily distinguished by redissolving on the application of heat.* Even the addition of fresh warm urine often suffices to redissolve it. It is usually yellow, pink, or red in color, owing to its intense affinity for the coloring matter of the urine (brick-dust sediment). Occasionally, however, as in children and gouty subjects, the deposit is of a pure white or pale yellow color. Chemically the sediment is usually composed of uric acid in combination with soda, potash, and ammonia (*mixed* urates), and presents no crystalline structure (*amorphous* urates). As these urates are only sparingly soluble in cold urine of an acid reaction, the most common conditions of their precipitation are: *low temperature*, *concentration*, and *unusual acidity* of the fluid. Deposit takes place, therefore, only *after the urine has cooled*, and may occur under a great variety of circumstances, which either diminish the amount of urine or increase its acidity. Thus, active exercise, a night's dissipation, a change or indiscretion in diet, an ordinary cold, and all feverish states of the body, may act as exciting causes. The transient ap-

pearance of this sediment, although always an indication of an abnormal condition of the urine, is usually entirely unimportant; but when it recurs *frequently* in the *absence of fever*, it demands attention as a possible indication of chronic disease in the stomach, liver, heart, or other important organ.

Finally, it should be mentioned that occasionally the urates are *crystallized*, and are then liable to be deposited within the urinary passages, involving the risk of formation of stone. Under these circumstances the urine is often *turbid when passed*, but becomes clear on heating. This form of turbid urine is especially common in infants and young children during febrile attacks, and it is probable that the great frequency of stone in the bladder in early life is largely owing to the repeated deposition of this material within the organ at such times.

Treatment.—When due to temporary causes, the deposit needs no other treatment than a simple diet, abstinence from alcoholic stimulants, particularly beer and sweet wines, the use of Vichy or some other alkaline water at meals, and a tumblerful of plain water at bed-time. In chronic cases medical advice should be taken.

Uric Acid.

As we have already seen, uric acid is usually combined in the urine with alkaline bases, forming urates which are soluble in ordinary conditions of the secretion. In its *free* state, uric acid is very insoluble, and is precipitated in the form of minute *brown crystals*, which are often large enough to be seen by the naked eye, and then resemble a deposit of cayenne pepper. The red or brown color of the crystals distinguishes them from all other crystals which occur in the urine. The most delicate test for uric acid and its salts is the production of a bright violet color by treatment with nitric acid and ammonia (murexid test). Place a small quantity of the suspected substance upon a piece of glass or porcelain, add two drops of strong nitric acid, and apply heat over a spirit-lamp until the liquid is evaporated. If uric acid or its salts be present, the addition of a few drops of ammonia-water will develop the bright violet color of murexid (purpurate of ammonia).

The significance of a sediment of uric acid depends mainly upon two circumstances: 1, whether the precipitation takes place *before* or *after* the urine is voided; 2, the frequency of the deposit. After standing for several hours, even healthy urine not unfrequently deposits a small amount of uric acid, which has been liberated from its combination with alkaline bases subsequently to

the emission of urine. When, however, a deposit of *red sand* takes place before the urine has cooled or immediately afterwards, there is reason to suspect that these insoluble crystals may have been formed within the urinary passages; and since uric acid constitutes the most common basis of gravel and stone, the frequent repetition of a sediment of this character must always be regarded with apprehension.

Treatment.—Occasional deposits due to transient causes, such as an attack of indigestion, or feverishness or other influences which increase the acidity of the urine only temporarily, are usually unimportant, and may be relieved by the same treatment which was recommended for the urate deposit. On the other hand, a persistent tendency to uric acid sediment is commonly connected with a gouty disposition or with chronic disease of the heart, liver, etc., and requires therefore the attention of a medical adviser.

Phosphates.

The three varieties of phosphatic deposit met with in the urine —amorphous phosphate of lime, crystallized phosphate of lime, and ammoniaco-magnesian phosphate—possess certain characters in common which distinguish them from all other sediments. They occur only in urine which is nearly or quite *alkaline*, are *white* in color, *remain unaffected by heat*, and are *redissolved by acids.*

Amorphous Phosphate of Lime is a normal ingredient of the urine, derived partly from the food and partly from the disintegration of certain tissues and fluids of the body. It is soluble in acid urine, but may be precipitated whenever the urine becomes neutral or actually alkaline. Transient alkaline conditions of the urine, accompanied by this deposit, may be occasioned by several causes: an excessive indulgence in sweet or sub-acid fruits, alkaline medicines, a bout of smoking (possibly from the absorption of ammonia generated by burning of the tobacco), and occasionally by an overstrain of the mental faculties. In such cases the emission of white, turbid urine, commonly during the morning hours, often excites great alarm; but the symptoms will generally disappear on removal of the exciting cause. A frequent occurrence of this deposit, however, is always a sign of serious disturbance of the health, located generally in the nervous system, and requires careful attention. The *Crystallized Phosphate* is rare. Its significance varies; sometimes it occurs in urine which is faulty only in a depressed acidity, but generally it is regarded as an indication of serious organic disease in one of the internal organs. *Ammoniaco-*

magnesian Phosphate (or triple phosphate) is a crystalline substance produced in *decomposing* urine by the generation of *ammonia*, which combines with phosphoric acid and the phosphate of magnesia to form a double salt. To the naked eye triple phosphate presents much the same appearance as the amorphous phosphate, and can be distinguished from the latter with certainty only by a microscopical examination, although the nature of the deposit may be *suspected* if the urine have an ammoniacal odor. When present in any such amount as to render the urine turbid when voided, this sediment almost invariably indicates ammoniacal decomposition of the urine within the urinary passages, particularly the bladder, and points therefore to the most common cause of urinary decomposition, viz., an inflammatory condition of these parts. It is necessary to bear in mind, however, that decomposition may take place rapidly even in feebly acid *healthy* urine, if the latter be passed into a vessel containing urine that has already become decomposed. Triple phosphate, in connection with the amorphous phosphate of lime, is a common cause of calculus.

Oxalate of Lime.

With very rare exceptions, oxalate of lime never forms a deposit sufficiently copious to be recognized by the naked eye in ordinary receptacles of urine; and even when the sediment is carefully collected by allowing the urine to stand for a few hours in a tapering glass, a microscopical examination is always necessary. Minute quantities of these insoluble crystals are occasionally seen in urine passed by persons who are to all appearance perfectly healthy. Such transient deposits are scarcely to be regarded as abnormal, but when large amounts of oxalate of lime are discharged persistently for weeks or months together, the symptom always demands serious attention. The chief danger lies in the formation of an oxalate of lime stone, this being one of the most common varieties of calculus ("mulberry" calculus). By many authorities, also, these deposits are supposed to indicate the existence of a special morbid condition known as the oxalic acid diathesis or *oxaluria*, which is said to be more frequent in *men* than in women, and to be characterized by the following symptoms, viz.: flatulent indigestion, palpitation, backache, frequent urination, loss of sexual desire, irritability of temper, despondency, and even profound melancholy. This group of symptoms often occurs, however, without oxalate of lime in the urine; and, on the other hand, oxalate of lime may be continuously present in the urine in quantities sufficient to form a mulberry calculus, without any of the above symptoms being manifested. It is

highly probable, therefore, that when the symptoms and the deposits in question occur together, they are both merely effects of a common cause residing primarily in the nervous or digestive systems.

Treatment.—Whatever may be the correct explanation of such cases, there can be no doubt that their successful treatment lies far more in attention to hygiene than in administration of drugs, useful as the latter unquestionably are as auxiliary means. Travel, if possible—at all events, an abundance of out-door exercise ; cold sponging of the skin, with friction ; moderation at meals, with exclusion of such articles of food or drink as contain oxalic acid or substances convertible into it, viz., rhubarb, apples, and all sweet fruits, effervescent wines and beer ; and finally, in districts where the water is impregnated with lime, the use of *boiled* or distilled drinking-water—these are the most important hygienic regulations.

Pus or Matter.

A collection of this sediment often resembles a deposit of phosphates, but is distinguished from it by remaining undissolved after the application of heat and the addition of an acid, and by being converted, on treatment with a strong alkali (liquor potassæ or aqua ammoniæ), into a *ropy* mass which can be drawn out into long strings. This ropy appearance is characteristic, and is not unfrequently seen in the highly ammoniacal urine discharged in some cases of inflammation of the bladder. Pus in large quantity renders the urine *turbid or milky* when passed, and produces a *yellowish white* deposit. As pus is always a product of inflammation, its significance in the urine naturally depends upon its *source*. The *direct* sources are the kidneys and the passages through which the urine flows in its escape from the body ; the *indirect* are the generative organs in women, and an abscess external to the urinary passages.

Blood.

Urine containing blood may present a variety of colors, from a *smoky* tinge to a pink, or reddish, or even deep brown hue—the particular shade depending upon the *amount* of blood and the *length* of *time* it has been in contact with the urine. The smoky tinge due to minute quantities of blood is often seen during the course of Bright's disease. When the color differs from that of ordinary bright red blood, a microscopical examination is necessary for the detection of the red blood-corpuscles. The sources of blood in the urine are in general the same as those of pus (see above).

The preceding list includes all the deposits of *common* occurrence in the urine, with the exception of casts of the uriniferous tubes. These will be considered under the head of Bright's Disease. It is to be particularly noted, in conclusion, that the sediments which *most frequently* induce turbidity of the urine, viz., uric acid, urates, and phosphates, *never indicate disease of the kidneys;* and that the less frequent deposits of blood and pus, which occasionally occur in this connection, may arise from causes entirely independent of the kidneys.

DISEASES OF THE KIDNEYS.

Saccharine Diabetes.

Saccharine Diabetes, or Diabetes Mellitus, is essentially a chronic affection, characterized by an excessive flow of urine containing sugar, and by certain well-marked disturbances of the general health. It is to be distinguished, therefore, from merely temporary conditions, in which sugar appears in the urine *at times* without inducing any of the symptoms to be presently described. Sugar is a normal constituent of the blood, derived partly from the sugars and starches present in food (starch being normally converted into sugar within the intestinal canal), and partly from the *glycogen* of the liver, a starchy substance manufactured in that organ from *animal* as well as vegetable materials, and transformed into sugar on absorption into the blood. In health this sugar is used within the body partly for its nourishment, and partly, also, for other purposes as yet but imperfectly understood. If the sugar, however, be formed in excess or fail to undergo its further changes, it accumulates in the blood, acts there as a foreign substance, and is expelled by the kidneys along with the large quantity of water necessary to hold it in solution. Strictly speaking, therefore, saccharine diabetes is not a disease of the kidneys, but is rather a blood-poisoning from excess of sugar. The causes which lead to this accumulation still remain unknown, although much study has been devoted to the subject.

Symptoms.—The first symptoms noticed are usually intense thirst and a marked increase in the flow of urine. Sometimes attention is first drawn to the complaint by the deposit of sugar on the clothing, or by the fact that flies are attracted to the saccharine urine, or by the occurrence of distressing itching of the genital organs; this symptom being due to the irritating lactic acid into which the sugar deposited on these parts is occasionally converted. The urine is clear, pale, of high specific gravity (1.030 to 1.060 and upwards), contains sugar, and varies in quantity from

six to fifteen, or even thirty pints daily. In severe cases the chief symptoms besides those mentioned are : emaciation in spite of a usually fair and often excessive appetite ; parched condition of the mouth ; a peculiar hay-like odor of the breath, resembling that of the urine ; decay and loss of the teeth ; marked dryness of the skin, with a disposition to boils, carbuncles, and eruptions ; obstinate constipation, sometimes alternating with diarrhœa ; impairment of vision, and in some cases blindness from cataract ; depression of spirits, and both mental and physical prostration. Death may occur suddenly from collapse after some unusual exertion ; more commonly the fatal result is due either to gradually progressing exhaustion or to the occurrence of dropsy, or to the supervention of pulmonary disease resembling ordinary consumption. This grave type of the disease occurs most frequently in early and middle life. In old age, and sometimes in middle life, especially in *corpulent* persons, diabetes may be a comparatively mild disorder, readily controlled by treatment, or perhaps disappearing after a time spontaneously. Between these two extremes, there are various degrees of intensity, and not unfrequently cases which are of a mild character at the outset ultimately assume the graver form. The following are unfavorable indications : youthful age, rapid loss of flesh, persistence of *considerable* sugar in the urine, even after withdrawal of saccharine and starchy substances from the food ; marked debility, loathing for food, excessive flow of urine of very high specific gravity, and the occurrence of lung disease or dropsy. On the other hand, the prospect is encouraging when the individual is past middle life, when the sugar almost entirely or completely disappears from the urine on regulation of the diet, when the symptoms are of a mild grade, and finally, when the individual is able to incur the necessary expense of the dietary regulations mentioned below, and possesses the courage to give them a thorough trial.

FIGURE 133.—Fermentation test for sugar in saccharine diabetes.

Tests for Sugar in the Urine.—*Fermentation test.*—Fill a bottle or test-tube, containing a little yeast, with the suspected urine, and carefully invert into a dish partly filled with the urine. Set aside in a warm place for twenty-four hours. If sugar be present, fermentation ensues, and the sugar is decomposed into alcohol and carbonic acid gas, the latter rising to the top of the inverted vessel and displacing a portion of the urine. The test is somewhat uncertain, and does

not detect very small amounts of sugar; therefore physicians are accustomed to rely upon others which are more delicate, but which also are too difficult to be successfully used by those not practically familiar with them.

Treatment.—The treatment of diabetes consists mainly in a careful regulation of the diet, so as to confine the amount of sugar in the blood within healthy limits. In many cases this result can be secured by a simple abstinence from all articles of food which contain sugar or starch. In other cases this measure fails, because the liver continues to form from the animal food an excessive amount of glycogen, which is converted into sugar on its absorption into the blood. Still, in spite of the frequent failures of the dietetic treatment, and the frequent necessity of modifying it in certain particulars, it supplies, at present, the most reliable means of alleviation, if not for cure. Such an important alteration from ordinary diet should, of course, be undertaken only under the supervision of a medical adviser. The following table, taken, with some alterations, from Dickenson's work on Diabetes, will supply general directions:

STRICT DIABETIC DIET.

WHAT TO EAT.	WHAT TO DRINK.	WHAT TO AVOID.
Fresh meat, without exclusion.	Water.	Sugar, treacle, honey.
Meat, salted, smoked, cured, potted, or preserved in any way except with honey or sugar.	Soda, and all mineral waters.	Common flour, bread.
	Tea, coffee, and cocoa from the nibs.	Maccaroni, vermicelli.
Poultry and game of all kinds.	All unsweetened spirits, Cognac, whiskey.	Corn flour, arrow-root, sago.
Fish, fresh or preserved.	Dutch Hollands.	Tapioca, oatmeal, barleymeal.
Soups made without common flour or prohibited vegetables.	Unsweetened gin.	Potatoes, beets, parsnips.
Unsweetened jelly, isinglass.	Rum.	Carrots, turnips, radishes.
Oil, dripping, and suet.	Claret.	Onions, celery, sea-kale, rhubarb.
Butter, cheese, cream cheese.	Red Burgundy.	Peas and beans.
Cream, curds.	White Burgundy.	Chestnuts.
Cooked green vegetables, cabbage, cauliflower, spinach, broccoli.	Chablis and Grave.	All sweet and preserved fruits.
	Hock and still Moselle.	Milk, whey, skimmed milk.
Brussels sprouts, turnip tops, French beans, the green ends of asparagus.	The driest pale sherry Amontillado or Vino de Pasto.	Chocolate.
		All malt liquors, with specified exceptions.
Uncooked green herbs, lettuce, watercresses, mustard and cress.		Cider.
		Champagne, and all sparkling wines.
Gluten flour and bread.		Port, Madeira, and all sweet wines.
Bran flour and cakes.		Sherry, except the driest.
Almond flour and cakes.		Sweetened spirits.
Almonds, filberts, walnuts, Brazil nuts, cocoa-nuts.		Liqueurs.
Condiments, glycerin.		

MODIFIED DIABETIC DIET.

Add toasted bread. " celery and sea-kale.	Add bitter ale. " milk.	

Among the forbidden articles in the above list, there is none whose deprivation is so seriously felt as bread. Several substitutes have been devised, the best of which are cakes made with bran, gluten, or almond flours. The bran cakes* are not unpalatable when well made, and tend to relieve constipation. Gluten bread is made from gluten which has been separated from common flour by frequent washings to remove the starch. It is more palatable and nutritious than bran bread, but is more apt to contain starch. Almond bread is an elegant, fairly digestible, but expensive preparation, made from the flour of sweet almonds, the sugar and gum being removed by boiling the flour in water slightly acidulated with tartaric acid.

When these kinds of bread are not obtainable, ordinary bread toasted almost to a crisp, and thus deprived of most of its starch, may be tolerated in mild cases. Water may be drank as freely as inclination prompts. Out-door exercise is very important, but the strength should never be overtaxed. Long journeys have in numerous instances proved fatal. Warm clothing should be worn, as the temperature of diabetic persons is usually below the normal.

* These may be made according to the formula given by Dr. Camplin, in his work on Diabetes: "Take a sufficient quantity (say a quart) of wheat bran, boil it in two successive waters for a quarter of an hour, each time straining it through a sieve, then wash it well with cold water (on the sieve) until the water runs off perfectly clear; squeeze the bran in a cloth as dry as you can, then spread it thinly on a dish and place it in a slow oven; if put in at night let it remain until the morning, when, if perfectly dry and crisp, it will be fit for grinding. The bran thus prepared must be ground in a fine mill and sifted through a wire sieve of such fineness as to require a brush to pass it through. That which remains in the sieve must be ground again until it becomes quite soft and fine. Take of this bran-powder three ounces (some patients use four ounces), three eggs, one and a half or two ounces of butter, and about half a pint of milk; mix the eggs with a little of the milk, and warm the butter with the other portion; then stir the whole well together, adding a little nutmeg and ginger, or any other agreeable spice. Bake in small tins, which must be well buttered, in a rather quick oven, for about half an hour. The cakes, when baked, should be a little thicker than a captain's biscuit. They may be eaten with meat or cheese for breakfast, dinner and supper. At tea they require rather a free allowance of butter, or they may be eaten with curd or any of the soft cheeses." Prepared bran flour in any quantity can be obtained from J. W. Shedden & Co., cor. Broadway and Thirty-fourth Street, New York. The same firm supplies also gluten flour.

Insipid Diabetes.

Insipid Diabetes, or *Non-saccharine Diabetes*, is distinguished from the ordinary saccharine form by the absence of sugar from the urine, and by the *low* instead of high specific gravity of the secretion. That the two forms are, however, more or less related to each other, is proved by the fact that they sometimes alternate in different generations of the same family, as well as by the interesting experiments of the French physiologist, Bernard, which show that puncturing the floor of the fourth ventricle of the brain in animals will excite a temporary saccharine or a temporary insipid diabetes, according to the location of the puncture. The causes of insipid diabetes, so far as they are at present known, are: hereditary tendency, a bout of drunkenness, intense mental excitement or fright, severe muscular exertion, copious drinking of cold liquids during perspiration, syphilis, and inflammatory and febrile diseases. In many cases the origin of the disease is obscure.

Symptoms.—The chief symptoms are excessive thirst and a very copious flow of urine of low specific gravity (1.002 to 1.006). Occasionally these are the only noticeable derangements, the general health remaining entirely unimpaired. As a rule, however, other disturbances are present: loss of flesh and strength, distressing dryness of mouth and throat, pains in the stomach and back, enfeeblement of the mind, and loss of sleep from the incessant desire to pass water. After weeks, months, or years of suffering, the individual finally succumbs to some disorder, such as consumption, inflammation of the lungs, or brain disease. The quantities of water drank by some of these persons is very remarkable. A French child, three years of age, drank two pails of water a day; after her marriage, at the age of twenty-two, her daily allowance amounted to four pailfuls. A patient in the Hôtel-Dieu drank, on an average, thirty-two pints of water every day. Sometimes a marked tolerance of alcoholic drinks is noticed. A patient of Trousseau, in Paris, repeatedly drank, for wagers, twenty bottles of wine at a single sitting, without manifesting any symptoms of intoxication. Until towards the end of the disease the appetite is usually excellent and sometimes enormous. Trousseau's patient, just alluded to, is said to have inspired such terror among the restaurant-keepers of Paris, where bread is allowed *ad libitum* at meals without extra charge, that one of them, after witnessing his inordinate capacity for bread, paid him money to dine elsewhere.

The duration of the disease varies exceedingly in different cases.

Although usually a very chronic affection lasting for months or years, it occasionally runs a very rapid course, particularly when it depends on organic disease of the brain, and proves fatal within a few weeks. In some cases the symptoms disappear spontaneously after an attack of fever or other severe disease. Insipid diabetes is more common in childhood and early life; saccharine diabetes in middle life and old age.

Treatment.—Regulation of diet is unnecessary, as it has no influence upon the course of the disease. Water may be allowed in sufficient quantity to allay thirst, but should be drank slowly, and not gulped down in copious draughts. Any considerable restriction in water is certain to produce great distress, and possibly serious prostration. Medical treatment generally fails to do more than keep the affection under control, but occasionally life may be preserved for years by such means, and by careful attention to the general health, until, finally, the disease seems to wear itself out spontaneously. It is not to be disguised, however, that with the exception of those comparatively rare instances in which the excessive thirst and profuse urination appear to be rather an idiosyncrasy than a disease, insipid diabetes is a very intractable and often a fatal affection.

Congestion of the Kidneys.

Experiments upon the lower animals have shown that by directing an increased flow of blood through the arteries of a kidney, or by impeding the escape of blood through the veins so as to considerably increase the pressure within the vessels, albumen and even blood may be made to appear in the urine. In a similar manner albuminuria (a condition in which albumen is present in the urine) may be produced in the human subject, either by a determination of blood to the kidneys in various inflammatory and febrile disorders of the body, or by an interference with the return-current of blood from the organ, such as occurs in certain affections of the heart and lungs, as well as in pregnancy when the renal veins are compressed by the enlarged womb. These congestions of the kidneys do not *as a rule* interfere seriously with the excreting function of the organ, and are therefore to be distinguished from the important structural changes which constitute true Bright's disease.

Bright's Disease.

This important disease, or rather class of diseases—for several distinct morbid processes are included under the general term—

received its name from Richard Bright, of London, who, in 1827, published a series of observations showing the dependence of certain forms of dropsy with albuminous urine upon structural changes in the kidneys. Before his time, although the occurrence of albuminous urine in connection with dropsy had been repeatedly recognized, and diseased kidneys had often been found at autopsies, the true relation between the symptoms in question and the renal changes had escaped attention. *"Bright's disease" is a generic term applied to a class of acute and chronic affections of the kidney, characterized by the presence of albumen and fibrinous casts of the uriniferous tubes in the urine, usually, also, by more or less dropsy and accompanied by various secondary disorders due to deterioration of the blood.*

A.—Acute Bright's Disease,

or, acute inflammation of the kidneys, may be induced by several causes, the most frequent of which are exposure to cold and wet, and blood-poisoning from *scarlet fever*, measles, erysipelas, etc. In some cases the cause cannot be traced. The general course of the affection is similar to that seen in the form produced by exposure to cold, which is briefly as follows: within a few hours, or a day or two after the exposure, a dull uneasiness or pain is felt in the back, with a frequent desire to void urine. The latter is scanty, of a dark bloody or smoky color, and on examination is found to contain a large amount of albumen, with fibrinous casts of the uriniferous tubes. The attack is generally ushered in by chilliness succeeded by fever, with perhaps nausea and vomiting. Soon dropsy takes place, the face becomes pale and puffy, and the limbs swollen. After a variable time, ranging from a few days to a few weeks, one of three results ensues: Either the dropsy subsides, the urine becomes more copious and clear, and *convalescence* is established; or the dropsy persists, the urine remains scanty, and *death* takes place with coma, convulsions, or from some other result of blood-poisoning; or the *affection becomes chronic*, and after a long illness protracted through months, or possibly two or three years, the patient finally either recovers, or, more frequently, succumbs to the disease. The prospect of complete recovery is much better when the disease is due to *scarlet fever*, measles, etc., than when it arises directly from exposure to cold.

To return briefly to the individual symptoms: the amount of *albumen* usually corresponds to the degree of inflammation, and is therefore a fairly reliable guide as to the severity of the disease. To detect albumen, fill a test-tube half full of the suspected urine,

and apply heat over a spirit-lamp to the upper half of the fluid, leaving the lower half as a standard for comparison. After boiling add *two or three* drops of strong nitric acid. If albumen be present, a white cloud is formed, which falls to the bottom on standing. For the detection of small quantities of albumen, the following procedure is preferable: Fill a test-tube to the depth of an inch with the urine; then, inclining the tube, pour nitric acid drop by drop slowly down the side, so as to allow the acid to sink to the bottom without mixing with the urine. If albumen be present, the following appearances are noticed: underneath, the colorless acid; above, the urine; and between the two fluids, an *opalescent* zone of coagulated albumen. The only other cloud that resembles this white zone of albumen is a deposit of uric acid salts; the latter, however, forms, not at the point of contact between the urine and the acid, but higher up, and disappears on the application of heat.

FIGURE 134.—Manner of holding a test-tube over a spirit-lamp so as to heat the upper portion of its contents.

The *casts of the uriniferous tubes* found in the urine are moulds composed of coagulated fibrin, in which may be imbedded epithelial cells, blood-corpuscles, pus-cells, etc. The appearances thus produced afford important indications of the changes taking place in the kidneys, but their detection requires some experience and the use of a good microscope.

Dropsy.—This symptom is due to the escape of the watery portion of the blood from the vessels, and is usually confined to the loose tissue underlying the skin. Not unfrequently, however, effusion takes place into more important localities: into the pleural cavity, producing pressure on the lungs; into the pericardium or bag inclosing the heart, impeding the action of the organ; into the lungs, threatening death by suffocation; and finally, into the cavities and tissue of the brain, inducing convulsions or profound stupor.

Uræmia.—This term is given to a group of symptoms which are directly or indirectly excited by the urea and other excrementitious substances retained in the blood. The so-called uræmic symptoms are: dyspepsia, vomiting, diarrhœa, muscular twitchings, defects of sight and hearing, headache, drowsiness, convulsions, and profound stupor.

Treatment.—This affection requires the most skilful manage-

ment. The administration of drugs by irresponsible persons is to be severely condemned, and if the services of a physician cannot be obtained, the disease might better be left to the curative powers of nature and the observance of the following hygienic regulations : Exposure to cold should be avoided by wearing flannel next to the skin, and, at the outset of the attack, by rest in bed in a room of uniform temperature. Alcoholic stimulants are always injurious in this affection. Water may be drank freely, for the purpose of washing out the obstructed tubes of the kidneys. Meat should be excluded from the diet so long as the urine is scanty, and, even after the secretion is restored, nitrogenous food should be used with caution until convalescence is well established.

B.—Chronic Bright's Disease.

Three distinct varieties of renal disease are included under this head : (1), chronic inflammation ; (2), granular or cirrhotic disease ; (3), waxy disease. Any two of these different forms may be associated in the same individual, so that it is not always possible to refer the symptoms to a single type. The distinction is important, however, when it can be made, since the course of the affection varies considerably according to the nature of the morbid condition.

1. *Chronic Inflammation of the Kidneys.*

This form of Bright's disease is generally the sequel of an acute attack, such as has just been described, and can therefore usually be traced to a definite cause : exposure to cold, or some preceding illness, viz., *scarlet fever*, measles, etc. Occasionally, however, it develops gradually without antecedent acute symptoms, and without an assignable cause. Dropsy and scantiness of urine are prominent features. Temporary amelioration of these symptoms is not infrequent, and even permanent recovery is by no means rare ; in fact, Bright's disease in this form is far from being as hopeless as is commonly supposed. In fatal cases the course of the affection is usually comparatively rapid, the common limit being from three months to a year, but occasionally extending to two or three years.

2. *Granular or Cirrhotic Disease.*

This is the most common variety of Bright's disease, though, on account of the usually less marked nature of its symptoms, it is not so frequently recognized as the other forms. Its access is always insidious, and there are no means known at present for detecting its existence until it has reached a more or less advanced stage. The renal changes consist in a slow degeneration resulting in shrinking of the organ and destruction of more or less of its secreting tissue. General dropsy occurs in some cases, especially towards the end of the disease, but usually this is not a prominent symptom. In most instances the dropsy is limited in amount, and is often absent altogether. The urine is *excessive* in quantity, compelling the person to rise at night one or more times. The specific gravity is *low*, varying from 1.007 to 1.015. Towards the end of the disease the urine may become scanty and of high specific gravity. Albumen is usually found in the urine in small quantities, and sometimes remains absent for considerable periods. If general dropsy occur, the amount of albumen increases. The general symptoms are those of constitutional rather than local disease; indeed, by the time the renal changes have become recognizable, they are commonly accompanied by structural alterations in other organs, particularly the heart and blood-vessels. The calibre of the smaller arteries is *narrowed* and their walls *degenerated*—conditions which predispose to bleeding from the nose, stomach, and into the brain (*apoplexy*). In consequence of the increased work required to force the blood through the narrowed vessels, the heart becomes enlarged, and beats violently or irregularly on any unusual exertion (palpitation). Dyspeptic symptoms are rarely absent, and sometimes vomiting recurs with such obstinacy as to lead to suspicion of organic disease of the stomach. In other cases attention is first drawn to the disease by the occurrence of gradual loss of eyesight. In still other instances the existence of the renal affection is wholly unsuspected, until the individual is suddenly stricken down by apoplexy, or sinks into a comatose state. Granular disease of the kidneys is essentially a chronic affection, and though it is always difficult to fix the date of its commencement, numerous cases are reported where it has lasted for five, ten, or even twenty years. The result is always fatal, the immediate cause of death being usually uræmic poisoning, apoplexy, dropsy of the lungs, or an attack of acute inflammation, particularly of the lungs (pneumonia).

Causes.—Of the numerous influences which induce this degeneration of the kidneys, the following are the most important: (1).

Intemperance.—The habitual use of ardent spirits repeatedly during the day, in quantities that do not actually intoxicate, is more dangerous in this connection than occasional gross excesses, because it subjects the kidneys to a constant irritation from which it has no opportunity to recover. (2). *Depressing emotions.*—The influence of anxiety or distress of mind in inducing Bright's disease is more potent than is commonly supposed. It is difficult to trace the chain of causation in these cases, but the fact that prolonged emotional disturbance can finally produce structural changes in important organs besides the brain is now well recognized. (3). *Gout.*—The gouty disposition, especially when inherited, is a very frequent cause of this affection, and occasionally manifests itself in this form of disease without at any time attacking the joints. (4). *Lead-poisoning.*—Plumbers, compositors, painters, and all persons habitually exposed to lead-poisoning, are specially subject to this form of Bright's disease; in fact, it is estimated that among painters fully one-half die from this cause. Dr. Dickenson even asserts that lead-poisoning is a more fertile source of this disease than any other *external* influence with which we are acquainted. (5). *Heart disease.*—The fact that valvular disease of the heart not unfrequently produces *congestion* of the kidneys with albuminuria, has already been noted (p. 481). When the congestion is long continued, it occasionally induces structural changes which are similar to, if not identical with, those of granular disease. Finally, this variety of Bright's disease belongs especially to middle or advanced life, and is more frequent in men than in women, because the former are more exposed to the usual causes, viz., intemperance, mental anxiety, gout, and lead-poisoning.

3. *Waxy Disease.*

This form of Bright's disease is commonly a *secondary* affection arising in connection with consumption, syphilis, disease of the bones and joints, or chronic suppuration in some part of the body. The term "waxy" refers to the appearance of the cut surface of the organ, which looks as if infiltrated with wax. The morbid process begins in the blood-vessels, which become abnormally pervious, and allow the escape of fibrin from the blood. Similar changes take place in the spleen and liver, producing enlargement of these organs, and in the arteries of the stomach and intestines, giving rise in many cases to obstinate vomiting and diarrhœa. Dropsy, profuse urination, and considerable albumen in the urine are also prominent symptoms. The duration of the disease varies with the cause. In most instances the downward

course is continuous, death resulting within a few months from exhausting diarrhœa, coma, convulsions, or the consequences of the primary disease. At other times, especially when the cause has been removed, the ultimately fatal result may be delayed for several years.

Treatment of Chronic Bright's Disease.—It must be evident, from the variety of morbid conditions which are classed under the general name of "Bright's disease," that there can be no uniform treatment for all cases, and that the so-called "cures for Bright's disease" are therefore open to the same objections that apply to all panaceas. Rational treatment consists not in prescribing something that is "good for Bright's disease," but in intelligently adapting the resources of medicine to the constantly varying conditions that constitute the disease, and to do this requires repeated and careful investigation of all the symptoms. As this task demands knowledge that the reader is not supposed to possess, we shall confine ourselves to a few important hygienic directions.

Care of the *skin* is indispensable, since a sudden check to the perspiration may superadd acute inflammation to the already existing disease. Flannel shirts should, therefore, be worn next to the skin, both in winter and summer, and all unnecessary exposure to cold carefully avoided. Perspiration may be encouraged by gentle exercise, when the strength permits, and by a hot-air or Turkish bath once or twice a week. These measures tend to relieve the blood of accumulated excrementitious matters, and often give great relief. The baths, however, should be used only under medical supervision, as they sometimes produce unpleasant symptoms when improperly employed. Removal to a warmer climate during the winter months is very desirable, when practicable. There is ample evidence that the sudden changes of temperature incident to this period of the year in temperate climates is a very important element in the causation and aggravation of Bright's disease, since the affection is much less frequent in both high and low latitudes, where the daily variation in temperature is less marked. Even the uniform cold of northern latitudes is less dangerous than the constantly changing climate of temperate regions. Southern resorts of a uniformly mild temperature are, however, to be preferred, viz. : the Bahamas (Nassau) Florida, the southern coast of California, the shores of the Mediterranean, etc. The *diet* should be simple, so as not to overtax the enfeebled digestive powers, and while a moderate allowance of *meat* is usually required for the maintenance of strength, an excess of animal food is objectionable, since the burden of removing nitrogenous substances from the body falls mainly upon the kidneys. As regards *alcoholic stimu-*

lants, entire abstinence is doubtless the safer rule for the great majority of cases, especially for those of gouty origin; in some instances, however, the moderate use of light wines acts favorably as a diuretic, and in emergencies the stronger stimulants may be absolutely demanded. When the disease has resulted from *lead-poisoning*, further exposure should be avoided if possible. If this be impracticable, as in the case of printers, plumbers, etc., who may be unable to abandon their occupation, the face and hands should be carefully washed before each meal, and the absorption of lead from the alimentary canal prevented by the free use during the day of sulphuric acid lemonade (five drops of sulphuric acid to a tumblerful of water), which converts the lead into an insoluble sulphate of lead. The lead already absorbed into the system is to be removed by a course of iodide of potassium and other measures best chosen by a physician. In the waxy form of Bright's disease a surgical operation may be required for the removal of dead bone, or to check suppuration.

Gravel, Calculi, Stone in the Kidney.

Concretions are not unfrequently formed in the pelvis of the kidney by the deposition of certain ingredients of the urine, generally uric acid or oxalate of lime. The smaller concretions are called gravel, the larger ones calculi. If the stone fail to escape through the ureter, it continues to grow, and may either remain as a harmless occupant of the cavity, or excite serious inflammation. The symptoms occasioned by the passage of a concretion from the kidneys to the bladder are commonly known as a "fit of gravel." The attack usually begins *suddenly*, sometimes gradually, with a severe pain in one side of the loin, shooting downward along the course of the ureter and inside of the thigh, and extending in males to the end of the penis, with retraction of the testicle on the affected side. The pain is accompanied by a frequent desire to void urine, which is passed in only a few drops at a time, and sometimes contains blood. Nausea and vomiting, and coldness of the surface of the body, are present in severe attacks. The pain ceases *abruptly* when the stone escapes into the bladder. Renal colic usually lasts but a few hours; occasionally, however, it is prolonged for several days, with intermissions of relief, during which the progress of the concretion is temporarily arrested. After reaching the bladder the stone usually escapes through the urethra without serious difficulty in the course of a few hours or days, and every discharge of urine should be carefully examined. If the urine and fæces happen to be passed into the same vessel,

the entire contents should be thrown onto a fine sieve, and repeatedly washed until only insoluble substances remain. The detection of the concretion is important, because occasionally the stone remains in the bladder, increases in size, and ultimately induces inflammation of the organ. The above symptoms are usually characteristic, but may be simulated by other affections.

Treatment.—In severe attacks, when medical advice cannot be obtained, the following palliative measures may be resorted to, viz.: a warm bath as hot as can be borne, the free use of drinking water, and in the case of an adult, the administration of from twenty-five to fifty drops of laudanum.

Rarer Diseases of the Kidneys.

Inflammation of the Pelvis (Pyelitis).

Inflammation of this portion of the kidney (see Anatomy) is most frequently caused by exposure to cold, the presence of stone in the pelvis, obstruction of the lower urinary passages producing retention and decomposition of the urine within this cavity, and the extension of inflammation upward from the bladder. The symptoms are often disguised by the existence of chronic disease of the bladder, and may escape attention entirely. In marked cases they consist of backache, frequent micturition, daily chills followed by fever and sweating, emaciation, and gradual exhaustion. The course of the affection varies according as the products of inflammation (pus, etc.) escape freely, or are retained in the pelvis by obstruction below. In the former case pus (or *matter*) is discharged constantly with the urine; in the latter case the pelvis becomes distended, so as to press upon and obliterate the kidney substance, and finally convert the organ into a bag of pus. One of three results now occurs: either the obstruction gives way and pus in large amount escapes with the urine, or the abscess bursts in some other direction, through the loin, or into the intestines or peritoneal cavity; or, in rare instances, a spontaneous cure is effected by the pus becoming inspissated and converted into an innocuous mortar-like, chalky, or even bony substance. Chronic pyelitis is a serious and often fatal affection, generally obscure in its symptoms, and very intractable to treatment.

Cancer of the Kidney.

Cancer occurs in the kidney in two forms: 1, as a primary affection, and 2, as an extension of malignant disease from some

other part of the body. In the latter form the symptoms are very obscure, and are rarely recognized during life. *Primary renal cancer* is usually met with either in early childhood or in mature life, the period between the tenth and thirtieth years being singularly free from the disease. It commonly attacks but one kidney, and occurs much more frequently in males than in females. The characteristic symptoms are : a tumor in the region of the kidney, bloody urine, pain in the loin, emaciation, and final exhaustion. The tumor is usually large and may attain an enormous size ; in one case weighing thirty-one pounds. The duration of the disease in children is generally less than a year ; in adults it averages about two years, and may extend even to seven or eight years. Recovery is unknown.

Hydatids of the Kidney.

These watery bladders or cysts, which are occasionally met with in man, in common with pigs, sheep, and oxen, are immature parasites which undergo their final development in the *Tænia echinococcus*, a minute tape-worm scarcely longer than a millet-seed, found in the intestines of the dog (Fig. 135). The circle of development may be traced as follows : The mature worm in the dog consists of three segments, the last of which, containing the generative organs, is cast off when fertilized, and escapes along with the excrement of the animal. The eggs, scattered by the bursting of this segment, become mixed with food or drinking water, and, passing into the intestinal canal of man or one of the above-mentioned animals, develop there into embryos, which bore their way or are carried by blood-vessels into the internal organs or tissues. Having arrived at their destination, the embryos become encysted, and develop into hydatids, or watery bags presenting the following appearances : Externally, the cyst is composed of a firm, fibrous capsule, within which lies a gelatinous bladder, called the mother-bladder of the echinococcus. This is filled with a watery fluid, and usually contains also numerous large and small vesi-

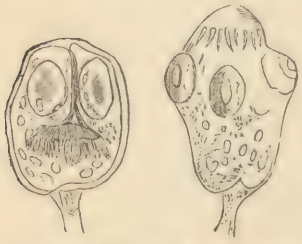

FIGURE 135.—(After AIKEN).—Two echinococci.

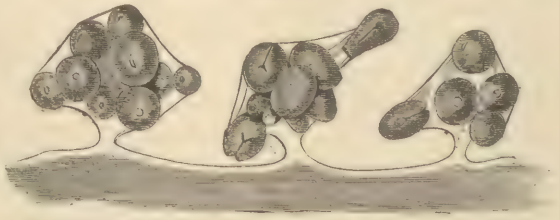

FIGURE 136.—(After WILSON).—Germinal membrane containing groups of echinococci.

cles, known as daughter-bladders, which in their turn may contain granddaughter-bladders. The mother-bladder is lined internally with a very thin, delicate membrane, called *the germinal membrane* (Fig. 136). This membrane is dotted with numerous white particles (echinococci), each of which represents the head of the mature tape-worm found in the dog (Fig. 138). The echinococcus embryo measures from $\frac{1}{100}$ to $\frac{1}{20}$ of a line in length, according as the head is extended beyond or retracted within the vesicle situated beneath it. The head is supplied with a double row of hooklets (Fig. 137), varying from 28 to 52 in number, which are less destructible than other parts of the parasite, and therefore supply an important means of diagnosis, when the parasite has been destroyed by suppuration in the cyst.

FIGURE 137. — (After DAVIDSON).—Hooklets of the echinococcus.

FIGURE 138.—(After VAN BENEDEN).—The mature tape-worm as it occurs in the dog.

Hydatid tumors in the human kidney vary in size from an egg to a child's head, or larger. With very rare exceptions, only one kidney is affected. As compared with other organs, the kidney is a favorable location for these tumors, because renal hydatids usually burst into the pelvis of the kidney and escape with the urine. The symptoms occasioned by such a rupture resemble those of an attack of gravel, and are followed by the discharge of several vesicles resembling a bunch of white grapes, and accompanied by shreds of membrane, and possibly some of the hooklets referred to above. These attacks commonly recur at shorter or longer intervals, and the emptied cyst finally shrinks into a harmless mass of dense tissue. Spontaneous cure occasionally takes place without rupture, as a result of death of the hydatid and absorption of the watery fluid. In less favorable cases the cyst either bursts in some other direction, especially through the lungs, or suppuration occurs within the cyst, producing the constitutional symptoms of a large abscess. The colic excited by the passage of the vesicles down the ureter may be relieved by the measures recommended for a fit of gravel (p. 489). When the tumor exerts serious pressure upon adjacent organs, or threatens to burst in an unfavorable direction, the cyst may require to be tapped for the purpose of drawing off the fluid, and thus causing the death of the parasite. This operation is less frequently neces-

sary in hydatids of the kidney, than where the parasite locates itself in the liver or lungs.

Hydatid disease in the human being is quite rare in America, more common on the European continent, and very prevalent in Iceland, where one-fifth of all deaths are stated to be caused by this affection. The excessive frequency of human hydatids in Iceland is accounted for by the extraordinary number of dogs on the island (a very large proportion of which are infested by the tænia echinococcus), and by the repulsively familiar relations which exist between these animals and the households of their masters.

Movable or Migratory Kidney.

Normally, the kidney is retained in a fixed position alongside of the spine in the lumbar region, by means of an investment of fatty tissue and a layer of peritoneum reflected over the anterior surface of the organ. Under certain circumstances, these attachments are loosened, and the kidney becomes more or less freely movable in the abdominal cavity. This dislocation may be unattended by any symptoms; in many cases, however, uncomfortable or painful sensations are experienced, which are very apt to excite serious alarm, especially if a movable tumor happen to be discovered in the abdomen. Uneasiness, or a dragging sensation, or shooting neuralgic pains may be produced by the erect position, or sometimes even by turning in bed. Occasionally paroxysms of intense pain, resembling an attack of renal colic, and accompanied by enlargement and tenderness of the tumor, are observed. The cause of these attacks is not well understood; the most plausible explanation is that at these times the kidney becomes twisted upon the ureter, thus producing an obstruction to the escape of urine and a consequent distention of the pelvis of the organ. The movable kidney is much more frequently met with in women than in men, and is very rare in children. The most common causes of dislocation are: relaxation of the fatty investment of the kidney, resulting from absorption of fat in wasting diseases; severe muscular exertion; falls or blows and, in women, repeated confinements or tight lacing. Relief from the above-mentioned disturbances may be obtained by wearing an abdominal bandage applied after replacement of the organ. Violent exercise and tight lacing should be strictly avoided, and the bowels should be kept regular, since constipation always increases the discomfort.

Rare Anomalies of the Urine.

Chylous Urine (*Chyluria*).

In this singular affection the urine has the appearance of milk, and usually coagulates into a trembling mass resembling *blanc-mange*. These appearances are due to the presence of chyle, the milky fluid formed in the intestinal canal by the digestion of fat, and absorbed therefrom by the lacteal vessels. Occasionally the chyle is replaced by lymph, and then the urine is clear when passed, but forms, on standing, a coagulum resembling calf's-foot jelly. The affection is confined, *with very rare exceptions*, to the inhabitants of tropical climates, particularly India, Mauritius, the Isle of Bourbon, West Indies, and Brazil, or to individuals who have passed some time in these countries. Recent investigations by Dr. Lewis, of Calcutta, and others, have led to the discovery in many of these cases, of a minute nematoid worm, $\frac{1}{75}$ of an inch in length (the *Filaria sanguinis hominis*), which infests, in immense numbers, the blood-vessels, and probably also the lymphatics. Rupture of the lymphatic vessels, it is supposed, may be produced by the lashing movements of a mass of struggling worms, and allow the lymphy or chylous contents of the vessels to escape into the urinary passages. Chylous urine has, however, been repeatedly noticed independently of parasitic disease, and in such cases the disorder still awaits explanation.

Intermittent Hæmatinuria.

This affection occurs almost exclusively in males. It is characterized by paroxysms lasting from three to twelve hours, and recurring, sometimes, with marked regularity, but more frequently at irregular intervals. Each attack is ushered in by chilliness, or a marked rigor and general malaise, accompanied by pain in the back, and perhaps nausea and vomiting. The first urine voided is of a deep porter or port wine hue, and throws down, on standing, a chocolate-colored sediment which consists chiefly of broken-down blood-corpuscles. The symptoms now gradually subside, and the previous condition of health is restored until the next paroxysm. During the intervals the urine is perfectly normal. The appearance of the urine during the attack is probably due to an intense transient congestion of the kidneys, which in some cases can be traced to malarial poisoning, but more commonly seems to be occasioned simply by an abnormal sensitiveness to the influence of

cold. The affection usually disappears spontaneously after a time or yields readily to treatment, but sometimes leads to a state of chronic invalidism. As regards treatment, by far the most important measure is careful protection against exposure to cold and wet.

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The Male Genito-Urinary Organs.

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THE MALE GENITO-URINARY ORGANS.

THE genito-urinary organs suffer more than other parts of the human body from neglect. This is largely due to ignorance, and is fostered by a strange false-modesty among English-speaking people which leads them to mention these organs only in a whisper and to regard their maladies as a disgrace.

Americans are peculiarly afflicted with this narrowness of mind. They shroud the whole subject, especially its sexual side, in unnecessary mystery, and encourage among growing children a general ignorance on all such matters ; an ignorance which defeats its own ends, since it leads the active mind of the child to seek for information in bad quarters, often to its own serious injury. Parents magnify the importance and the significance of all allusions made by children to their genital organs, and the child grows up inclined to be morbidly over-sensitive about the whole subject, and careless in such simple attentions to his person as common-sense alone would naturally dictate.

For fear of leading a boy into bad habits, his parents will not instruct him how to pull back his foreskin and wash away the accumulation of white, rancid material which the little glands of the region furnish. A boy whose face and hands are clean is often foully filthy under his foreskin, and the accumulation of this *smegma*, as it is called, gradually irritating the delicate mucous lining of the foreskin and creating an itching there, leads directly to masturbation, and produces the very vice which the fond parent stupidly supposed he was helping the child to avoid.

The absence of public urinals in American cities is another evidence of this weak-mindedness of the people, and another is the broken health and spirit of many a fine girl who has been ashamed to keep quiet and to be sick during her menstruation, lest some one should suspect her condition.

The urinary and genital organs are as honorable as any, and their hygiene should be attended to with as much respect. Their

derangement causes incalculable discomfort to the individual, and is the spark which kindles many a domestic tragedy.

The Prepuce.

The prepuce or foreskin is that fold of integument which ensheaths the head of the penis. The Hebrews in the sacred rite of circumcision, when the child is named, upon the eighth day, cut off this redundant skin and thus save the boy from many annoyances and sources of possible disease to which his less fortunate Christian brother is exposed. For it is not doubtful that all mankind would be better without a foreskin than with it. Whatever function it served for primeval man, the prepuce is unnecessary now and only attracts the attention of its possessor by its requirements for cleanliness, and of the physician by the diseases it occasions.

Under the foreskin, behind the raised ridge (*corona*) of the head of the penis, a whitish material collects, composed of fatty matter and dead skin, which gathers into little rolls, has a rancid fishy odor, and calls for removal on pain of exciting, sooner or later, an inflammation of the membrane against which it lies. On this point mothers should be careful to instruct their children while young, teaching them, whenever they take a bath, to pull back the foreskin, rapidly wash the end of the penis with a handful of soapsuds, dry it immediately, and replace the foreskin at once as a matter of routine.

Phimosis.

When the foreskin cannot be pulled back over the head of the penis, *phimosis* exists. Most babies have this deformity, but for the first few years of life phimosis is not important unless it gives discomfort or produces symptoms to be named presently. The orifice of the prepuce often enlarges with the growth of the child, so that moderate phimosis in babyhood may cease to exist in boyhood. When, however, the prepuce *balloons* during urination, showing that the preputial orifice is narrower than that of the urethra, then nothing can be hoped for from nature, and an operation is called for.

Sometimes the tightness of the prepuce is due to inflammation. In such cases the end of the foreskin becomes red and more or less swollen. Slight inflammation is apt to occur from time to time in the case of all children with a narrow prepuce, and it may be only at such times that the little patient shows symptoms of disorder. If

unrelieved and repeated, these attacks of inflammation, which originate on the inside of the prepuce, gradually cause adhesions to form between the latter and the head of the penis, and after these have been once formed a certain amount of inflammatory irritation of the end of the penis is pretty sure to persist until the prepuce has been removed or loosened and the adhesions broken away.

As a result of the irritation caused by phimosis, inflamed or with adhesions, the most varied disorders may arise by a process termed *reflex action.* Thus the child may be peevish, fretful, pallid. He may look ill without being actually sick. He is apt to pull at his penis, attempting to relieve a discomfort he feels there. He passes water too often, especially at night. He is apt to wet the bed. He is found awake at night with the penis hard and erect, tossing about uneasily, ignorant of what distresses him. He will perhaps have erections during the day. His symptoms may reach the extent of mild inflammation of the bladder, accompanied by much straining and more or less falling of the bowel. His reflex symptoms, indeed, may go to the extent of paralysis of groups of muscles ; to the simulation of joint disease, occasionally his mind becomes involved, and any or all of his functions may be more or less perverted as a result of this trifling local irritation at the end of the penis.

So much for the young child.

The growing boy is apt to be invited to self-abuse by the irritation attending phimosis, while frequent urination and all the other symptoms of an irritable bladder are occasionally due to this condition.

After middle life phimosis does not do so much harm, indeed one may have phimosis at any age and not suffer ; but a majority certainly do. Occasionally old men are met with who have never been seriously inconvenienced by phimosis, who have married and reared a family without ever in their lives having been able to draw back the foreskin.

Whether a tight prepuce causes symptoms or not, it is always liable to become the seat of inflammation and to give trouble, and it is the part of wisdom to do away with the defect.

Treatment.—Phimosis is cured by cutting away the foreskin or slitting it up, according to its length and tightness. The inflamed conditions which cause most of the symptoms, however, are met by the use of dilute lead-water, both externally and thrown into the cavity of the prepuce with a syringe. A lotion made of from half a grain to two grains of sulphate of zinc in an ounce of rose-water, may be used in the same manner, or a wash of three parts

of water to one of aromatic wine. These lotions and injections under the prepuce should be often repeated, being always so mild as not to cause smarting; but no treatment of the irritation is so valuable as the surgical removal of the cause (the phimosis).

Para-phimosis.

This condition exists when the prepuce has been pushed behind the ridge of the head of the penis, and remains there. The parts quickly swell, and the whole member becomes distorted. If unrelieved, the strangulated parts in front of the constriction may mortify after a time.

Treatment.—Reduction may be readily effected if the mischief is detected early, by compressing the head of the penis side-ways with the thumb and fingers of one hand, while the other hand encircles the penis and draws the skin forwards. If reduction cannot be accomplished after a few attempts, a physician must be summoned

Cutaneous Affections of the Penis.

Besides ordinary skin diseases and contagious venereal ulcers (described elsewhere), two common maladies of the integument of the penis call for a few words.

Herpes Progenitalis consists of clusters of minute water blisters grouped together, much resembling "fever sores" on the mouth, tingling somewhat, drying up into a scab in a few days on the outside, and yielding distinct ulcers when occurring under the prepuce. They are often due to local irritation; sometimes they appear spontaneously. They occur in youth and middle life.

If these spots can be detected when first coming out, they may be modified in intensity by touching them with a drop of spirits of camphor or of strong tincture of aconite root. Once fully formed the lotions advised for inflamed states of the prepuce (see preceding page) answer very well. Ulcers may be dusted with powdered oxide of zinc and calomel, or with powdered iodoform, where the odor of the latter is not objectionable.

Warts upon and under the prepuce are very common in early life—especially in connection with uncleanly habits or inflammations of the region. They generally yield to cleanliness and to dusting the parts freely with calomel. They may be radically treated by snipping them off with curved scissors and cauterizing the base from which they grow with nitrate of silver. Large crops of warts generally call for tonic internal treatment with cod-liver oil as one of its elements. Tincture of the leaves of Arbor Vitæ (*Thuja occidentalis*) locally, is serviceable in such cases.

Cancer of the Penis.

The common variety (*epithelioma*) usually commences after middle life, as a warty looking, flat, more or less excoriated spot on the prepuce, or on the under side of the end of the head of the penis. The continuance of such a little rawish spot first attracts attention. Finally, an ulcer appears and eats its way backwards. The remedy is the surgeon's knife.

Wounds and Contusions of the Penis.

Wounds of the penis, if deep, are apt to bleed freely. The member should not be bandaged, but washed off with cold water, and when it becomes evident from what part of the wound the blood flows, that part should be firmly seized between the thumb and forefinger and held until the surgeon arrives. Much pressure is not necessary to arrest bleeding.

Contusions of the penis are sometimes attended by pretty free effusion of blood under the skin, so that the member promptly becomes black and swollen. Until medical aid is obtained, rest and ice-water compresses constitute the treatment.

The Urethra.

The urethra is the canal through which urine passes out from the bladder. It is about eight inches long in adult life. Its external orifice is called the meatus. Some notion of its different parts is desirable; the following cut may help to make them comprehensible.

FIGURE 139.—General view of the male organs of generation: T, testicle, x, y, the larger and smaller extremities of the epididymis; vd, the vas deferens; vs, vesicula seminalis; p, the prostate; B, the bladder; ur, the urethra; *b*, the bulb; cs, the corpus spongiosum; cc, the corpus cavernosum; g, the glans; p, the prepuce.

The urethra is divided into three portions: (1) pendulous urethra, which takes the direction of that portion of the penis lying outside of the body; (2) membranous urethra, lying beneath the bone, and fixed in its position and shape. This is the part injured by falls upon the crotch with the legs apart; (3) the prostatic urethra surrounded by the prostate,

receiving the ejaculatory ducts from the seminal vesicles, and terminating in the neck of the bladder.

The urethra is surrounded with muscular fibres which keep its walls in contact. The membranous urethra has, also, a covering of muscles under control of the will: a group called, collectively, the cut-off muscle which any healthy person may cause to contract at will and arrest the stream of urine suddenly. It is in this group that spasmodic stricture is usually situated, and it is the refusal of this group of muscles to relax which makes it impossible, sometimes, for an individual to urinate in another's presence.

The urethra is always moist. It is studded with numberless little glands which supply a translucent, sticky mucus. In conditions of excitement this natural mucus is thrown out in excess by the glands and appears at the meatus as a pellucid drop, often arousing the suspicion of disease in the minds of young people preoccupied about themselves. This is not a malady. A perfectly limpid sticky drop of fluid at the meatus after local excitement is natural. If it were not there it would indicate some disease of the glands whose function it is to supply this mucus upon call.

Deformities of the Urethra.

The urethra is sometimes deformed. It may be imperforate or congenitally strictured. This condition shows itself soon after birth by an inability on the part of the child to pass water. The urethra may open on the top of the penis, or underneath, or into the bowel. The penis may be variously contorted and the urethra with it, but none of these conditions can be mended by domestic surgery.

One deformity, however, requires comment, since it bears such a direct causal relation to a number of the affections of the urethra and bladder; it is an unnaturally small meatus. Just as phimosis may fail to cause its possessor any annoyance during a lifetime, so very much more often does a small mouth to the urethra pass unnoticed and give rise to no discomfort. Yet it is well to know that a small meatus may occasion considerable mischief; pain in the urethra; irritation of the bladder, leading to frequent micturition, and to inflammation of the bladder; reflex pains and disturbances of the most varied character, like those described for phimosis; and all of this in so insidious a manner that the patient never suspects for a moment the true cause of his varied disorders. The mechanism of this action need not be described here. Most unquestionably cases occur where a small meatus alone is the cause of serious disorder, and there is no longer any doubt about them in

the minds of practical observers. Even Civiale, years ago, refers to cases of this sort, and speaks of inflammation of the bladder due solely to a tight meatus; when the latter was cut the inflammation got well.

A meatus which is too tight may be recognized by finding out whether there is a pocket behind its lower angle. The floor of the urethra should come out evenly at this point, and there should not be the slightest bridge of skin across it. If, therefore, a blunt probe drawn along the floor of the urethra—the instrument being held nearly at a right angle to the canal—can be made to catch in the lower angle of the meatus, the latter is too small and should be freely cut in all cases of obscure disease involving the urinary passages. This little operation can do no harm and may do an immense amount of good. If the patient suffer no inconvenience therefrom, mere smallness of the meatus is no reason for interference on the part of the surgeon.

Neuralgia of the Urethra.

Pain of a neuralgic sort along the urethra is generally due to a contracted meatus, a stricture of large calibre or some congestion of the prostatic urethra or neck of the bladder. Its consideration and treatment fall to the surgeon.

Inflammation of the Urethra (*urethritis*).

This ailment is a very common one. It may be due to a vast number of different causes. Contact with the disease in another person is by no means the sole cause. Married men often come legitimately by urethritis. Excess in natural relations, contact of the urethra with a leucorrhœal discharge, menstrual blood—any one of these is sufficient sometimes to occasion urethritis, especially in one who has previously suffered from this malady. Men differ very much in their susceptibility to being inflamed by contact with discharges not in themselves poisonous.

Besides this set of causes, more or less urethritis follows all injuries to the canal of any kind, mechanical or chemical. Highly acid states of the urine due to excess in drinking (particularly sweet and fermented liquors, champagne or beer), may alone cause urethritis, especially if the urethra has been already damaged by previous inflammation. The concentrated acid urine of gouty people may provoke in them a mild urethritis if the patient be run down or much fatigued, while stricture of the urethra, for the most part, is attended by some urethritis as one of its necessary

symptoms. The most obvious symptom of urethritis is a creamy discharge of matter from the meatus. Attending this, according to the grade of the inflammation, is more or less redness and swelling of the orifice of the urethra and heat along the course of the canal, pain on urination and pain when the organ becomes rigid. This last pain is due to the stretching of certain portions of tissue outside of the mucous membrane, where the inflammation has penetrated beneath the surface. Such portions of the spongy tissue become inelastic, and do not distend with blood, as does the rest of the organ during erection. The portion which does not dilate is therefore shorter than the rest of the member, and the penis becomes curved (generally downwards) during erection, in a condition known popularly as *chordee*, great pain being felt along the shorter portion of the curve.

When urethritis begins shortly after an exposure to contagion —within forty-eight hours—it is apt to run a mild course. If it commences on the sixth, seventh, or eighth day, it is pretty sure to be severe. The symptoms last from a few days in mild cases up to many months in severe ones—and indeed a slight discharge of mixed pus and mucus may continue for years after an attack. As complications of urethritis may be mentioned inflammation of the bladder due to an extension backward of the disease, inflammation of the testicle, abscess in the prostate, or around the urethra, a peculiar form of desperately chronic rheumatism which affects joints, tendons, muscles, and the eyes, and worse than all the others, a severe purulent inflammation of the eyes, *gonorrhœal conjunctivitis*, very violent in character, always tending to destroy the eye, and always due to direct contact of some of the urethral pus with the eye.

This fact just stated cannot be too seriously insisted upon. A general knowledge of it is most desirable. Ignorance of it has resulted more than once in total loss of sight.

No portion of any discharge from the urethra should ever be allowed contact with a towel, lest it may afterwards reach the eye, and the patient should in all cases wash his hands after touching the penis. Another important fact in connection with inflammation of the urethra is this : *stricture is the legitimate consequence of prolonged urethritis.*

Treatment.—The treatment of an active urethritis generally illustrates the truth of the saying—the more haste the less speed. No patient should attempt to gain time in his own case by the active use of injections from the first. If injections are used in the beginning of an attack, some one besides the patient ought to bear the responsibility. In mild cases of urethritis, very weak in-

jections at first are serviceable, unquestionably, but in an active, virulent attack they cannot do good, and may do an immense deal of harm.

The rules for a patient to follow during urethritis are these: Avoid activity of body of all sorts; drink plenty of water and milk, but no strong drink, wine, liquor or beer, strong tea or coffee; avoid all spices and stimulating sauces, as well as rich and indigestible articles of food; attend to the functions of the bowels, and avoid exposure to cold and local or general excitement.

As for medical treatment, no patient can be made wise enough by any amount of written directions to bear the responsibility of conducting his own medical treatment during urethritis. Many persons do attend to themselves by the aid of suggestions from an apothecary, but such a course is unwise in view of the very serious complications which may arise, complications which sometimes lead to the loss of important functions, sometimes even terminate in death. A surgeon is the proper person to be consulted.

Stricture of the Urethra.

A stricture of the urethra is a tightness of the canal, either congenital (as of the meatus, already considered, p. 502) or acquired. The latter are (1) organic, due to inflammation (urethritis), or the result of injury (particularly of bruising injuries to the crotch); or (2) muscular, due to irritation somewhere along the canal, or to nervous causes.

Vastly more common than all other causes in the production of organic stricture is inflammation of the urethra—urethritis. Stricture may follow a urethritis by the short interval of a few weeks, or it may be twenty years before it declares itself by obvious symptoms.

The symptoms of stricture are a gleety discharge from the meatus (or clusters of matter, or shreds in the urine), sometimes pain and irritation of the bladder, and reflex symptoms of the most varied character. Finally, where a stricture becomes very tight, whether it be organic or muscular, a narrowing of the stream of urine, or at last even retention of urine comes on, with all its disastrous consequences to the bladder, the kidney, and possibly the life of the patient. When stricture is tight the urine starts slowly and dribbles away at the end of urination. There may be two or more curiously curved streams instead of one, or the stream may be very small, perhaps dropping down without force from the end of the penis.

Spasmodic strictures may yield the same symptoms as organic

obstructions, and, indeed, the line of symptoms covered by stricture includes nearly all the irregularities of function and conduct to which the urethra is liable.

In no case of chronic or obscure disease even remotely involving the urinary organs, should the surgeon omit to examine the urethra for stricture.

Treatment.—The treatment of stricture cannot be carried on by the patient himself, but must be entrusted to some competent surgeon.

Strictures in the pendulous urethra may be radically cured by thorough division with the knife. Deep strictures are apt to recontract after any operation, and should be kept open by the patient himself by the occasional use of a full-sized steel sound after cure.

The Prostate.

The prostate gland, so called, is really a muscular body receiving the neck of the bladder and surrounding the first portion of the urethra. An idea of its relative size and position may be obtained by a glance at the figure on page 501. It lies in contact with the end of the lower bowel, where it may be readily examined by the surgeon's finger through the wall of the gut. A portion of the seminal vesicle lies enshrouded in it, and its substance is tunnelled on either side by the ejaculatory duct which brings the seminal fluid from the vesicle during the orgasm into the sinus or cavity of the prostate, whence it is ejected in spasmodic jets by the involuntary contractions of the muscular tissue of which the prostate is mainly composed. The function of the prostate is therefore solely a sexual one. It is absent in the female.

The prostate is composed of two symmetrical lateral portions called lobes. In disease a third (middle lobe) sometimes develops posteriorly and causes much trouble. In the nerves which terminate on the surface of the mucous membrane lining the sinus of the prostate lie the seat of the sixth special sense—the sexual sense—and it is the proximity of this region to the sensitive neck of the bladder which makes the prostatic sinus so important a factor, oftentimes, in the causation of diseases of the bladder as well as of the deep urethra.

When a sensitive organ is abused it becomes more or less deranged. No one wonders at dyspepsia produced by irregularity and excess at table. An eye damaged by neglect, bad care and over-use does not occasion surprise, yet it is customary, with certain people, to shamefully abuse the sexual function by over-use,

by irregularity, by stimulation without relief, and yet surprise is felt when this region goes wrong in a persistent, chronic way, and when disorder here lights up functional and even inflammatory distress in the bladder and neighboring urethra. The wonder is, on the other hand, that so many people remain as well as they do.

Neuralgia of the Deep Urethra.

Symptoms.—A certain sensitiveness deep in the crotch behind the scrotum, perhaps a throbbing in that region, or a sense of fulness on sitting down, made worse by constipation ; an uneasy feeling located in the rectum ; a pain on urinating, especially towards the close of the act ; a lack of perfection in the marital function ; an uneasiness attending its performance—perhaps amounting to pain. These symptoms, added perhaps to some irritability of the bladder, with possibly phosphatic urine and a tendency to spasmodic stricture, constitute neuralgia of the deep and prostatic urethra. Hypochondria usually attends these symptoms. The patient is gloomy and apprehensive, and often believes that he has spermatorrhœa, or that impotence is imminent.

The causes of this complaint are generally such as involve the sexual function, excess on the one hand, or, on the other and more often, stimulation by erotic thoughts and otherwise without natural relief. These causes, which cannot be fully discussed here, are widespread in their action, and most often to blame in the production of this malady. They are more apt to occasion morbid symptoms in a patient who already has slight stricture, or has just had a urethritis. The prostate in this malady is sometimes tender and congested. There may be an oozing of a gleety fluid from the meatus. If the symptoms do not subside surface inflammation of the prostate comes on, becomes chronic, and a seriously rebellious malady (chronic prostatitis) is the result.

Treatment.—The best treatment for neuralgia of the deep urethra is marriage, to insure a proper functional regularity of the parts involved. The gentle use of a steel sound, local applications of tannin and other stimulants, constitute the surgeon's best weapons. The cold water sound is of service. Any tightness of the meatus should be divided, and strictures must receive proper attention.

Prostatitis.

Besides the neuralgic condition of the prostate with congestion just described, the organ suffers from inflammations, superficial

and deep. The former are due to the spreading backwards of a gonorrhœal inflammation; to a prolonged continuance of local neuralgia with congestion; to stricture of the urethra, etc.

Old chronic cases of surface prostatitis furnish nearly all the symptoms characteristic of stone in the bladder. Gouty and rheumatic, or tubercular, broken-down subjects are most apt to suffer from these obstinate forms of chronic inflammation. Inflammation of the prostate may reach beneath the surface, giving rise to abscess in the prostate, or within its capsule.

Symptoms.—Such collections of matter occasion great pain, frequent calls to urinate, pain at stool, and often retention of urine. All these conditions of inflammation in and about the prostate are complicated by frequent and painful urination, and are attended by more or less fever and depression of spirits as characteristic features.

Treatment.—Rest, heat to the perineum (crotch) and over the lower part of the abdomen, alkaline and demulcent drinks (see **Formulas**), an occasional sitz-bath in very hot water (of short duration)—these constitute about the only means a patient can readily employ for himself. Anodynes are usually necessary. If abscess forms, it should be evacuated by the surgeon promptly; if possible, through the rectum. It may, if left to itself, break into the rectum, bladder, or urethra.

Tubercle and Cancer of the Prostate.

Tubercle of the prostate comes on slowly like a chronic prostatitis, with local pain and frequent micturition. The malady often appears in connection with the same disease in the kidneys or testicles. It is very slow in its course and sometimes gets well by change of climate, cod-liver oil, etc. Local treatment is of no value.

Cancer of the prostate gives all the signs of enlarged prostate at first. It generally occurs late in life. It is not a common malady. The course of the disease, failure in general health, hemorrhage from the urethra, the intensity of the bladder symptoms soon distinguish this malady from enlarged prostate. It is necessarily fatal.

Enlarged Prostate.

In round numbers one-third of all males after the age of fifty have enlarged prostate. Of this third a goodly number have practically no symptoms, so that they live and die in happy ignorance

of their condition. Sometimes the prostate grows small with age. Sometimes it remains of natural size, so that not all men suffer from symptoms due to prostatic trouble. Prostatic enlargement is a malady, and not a normal degeneration due to age. The only certain cause of its appearance is inherited tendency. No amount of previous inflammation of the urinary passage will produce it.

The false enlargement found in young people, due to congestion or chronic inflammation, is a totally different matter. When the prostate enlarges it does so by developing of new tissue like that of which it is naturally composed, and not by an inflammatory process, or by anything like it. The organ may grow outwardly in all directions by a symmetrical or unsymmetrical increase in the size of its two lobes, or by an enlargement of either, or finally, by the appearance of outgrowing prostatic masses, chiefly in the form of a projection upwards from the posterior wall towards the centre and into the urethral opening—the so-called third lobe.

The general results of prostatic overgrowth is to offer an obstacle to the free escape of the urine. The muscular fibres of the bladder, enfeebled by age, are forced to perform extra duty. The return of blood from the substance of the walls of the bladder is interfered with by the increased size of the prostate, whereby the weakened, overworked muscle suffers the further indignity of constantly acting under the disadvantage of being in a state of congestion, and therefore with an enfeebled circulation.

The natural result of enlarged prostate is, therefore (1), a weak bladder, tending to empty itself imperfectly, and (2) a certain amount of cystitis (inflammation of the bladder), tending to produce frequent calls to urinate. Nearly all the symptoms of enlarged prostate consist of disturbances in the function of the bladder, and are due to its weakness, to its congestion, and to the mechanical obstacle which it has to overcome in expelling the urine. The natural ultimate termination of prostatic obstruction, when unrelieved by treatment, is chronic inflammation of the kidney, culminating in one of the slow forms of Bright's disease.

Symptoms.—The symptoms of enlarged prostate vary greatly, as might be supposed, considering the different factors of their causation. If there is not much obstruction to urinary outflow, and if the bladder continues powerful, there may be no symptoms at all. The ordinary run of symptoms is as follows : An old man, otherwise hale, observes that it has become necessary to get up towards morning to urinate, then to get up once during the night. He thinks that this is natural at his time of life. Soon his calls at night become more frequent and he gets up several times. Meanwhile he does not suffer much by day, perhaps not at all, but his

stream of urine gradually diminishes in size and in the force with which it is expelled. The flow commences slowly and dribbles away at the end.

Matters may rest here for an indefinite period, but the tendency of the symptoms is to take one of two courses.

1. The irritability increases, the calls become more frequent, especially by night, more or less pain, throbbing, uneasiness, is felt deep in the crotch or in the rectum, increased by exercise or jolting; the action of the bladder becomes spasmodic, crampy, and in this condition there may be more or less involuntary escape of urine.

Here we have an irritable, thickened, contracted bladder, and sooner or later the bladder inflames more or less actively, and the symptoms of *cystitis* are complained of.

2. In the other state, where the obstruction is great or the bladder weak, the night-calls to urinate increase in frequency much more markedly than the day-calls, but the bladder gradually fills up, only discharging at each urinary effort the excess over a certain fixed residual quantity. There is less pain in these cases, not much spasm—perhaps none. The urine remains bright and clear, but there is a dull, dragging sense of uneasiness and weight about the belly and back, and the frequent calls to urinate sometimes become almost incessant, leading even to overflow and constant dribbling, forcing the patient to wear a urinal. In these cases the patient does not generally know, and will not believe, that he is carrying around a full bladder and only passing the excess above a certain fixed quantity. He complains that his bladder has become so small that it will hold little or no urine, and therefore demands frequent emptying.

In either of these two conditions, positive inflammation may set in, or retention may occur (the latter generally from a chilling, especially of the legs), and then the urine goes through a series of ammoniacal changes due to fermentation within the bladder. Decomposing urine liberates ammonia, which is an active irritant, and serves to congest and irritate the bladder to a still greater degree, and catarrh of the bladder results.

Prolonged catarrh of the bladder, of a mild grade, leads almost certainly to the formation of stone in the bladder, which, in its turn, serves still further to aggravate the symptoms. Hemorrhage into the bladder is sometimes met with. The straining at urination often brings on piles, or, perhaps, a slight prolapse of the rectum.

Treatment.—The enlargement of the prostate itself is not influenced by treatment. The symptoms caused by it, however, may be greatly alleviated—perhaps practically overcome—and the

secondary inflammatory changes in the kidney be prevented by appropriate means. Enlarged prostate causes its symptoms because it obstructs the free outflow of urine, consequently the first aim of treatment is to make art supplement nature where the latter is ineffective, and to insure thorough evacuation of the urine by means of a catheter.

There are two kinds of catheters to be commended for use by the patient upon himself in obstructive prostatic disease: that of Mercier and that of Jaques. Sometimes the woven English or the bulbous pointed French instruments yield greater satisfaction; and occasionally nothing is so serviceable as a silver catheter with bevelled eyes. But, all things considered, there are few cases where a Mercier or a Jaques instrument does not give satisfaction. Of the two the Jaques soft-rubber catheter has the most merit.

Mercier's catheter, Fig. 140, is soft, made of woven material, covered with black varnish. Its advantage is a permanent elbow in the woven material which makes the instrument enter the bladder readily, since its point follows the roof of the urethra, and easily rides over a posterior median overgrowth —the most common form of prostatic enlargement.

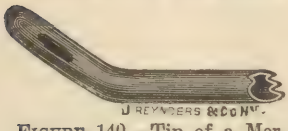

FIGURE 140.—Tip of a Mercier Catheter, showing the bend.

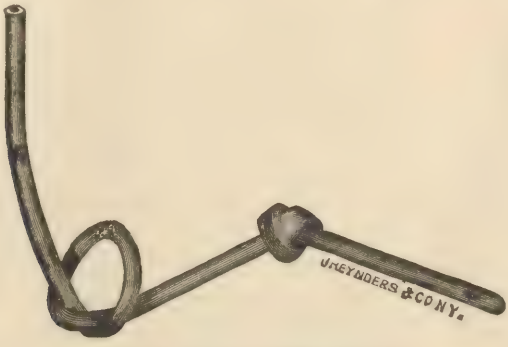

FIGURE 141.—A Jaques Catheter.

The adjoining figure shows a Jaques catheter. It is represented as being bent and tied up to show its great flexibility. It is, in short, nothing but a fine quality of rubber tubing, closed at one end, and provided with an eye. Its advantages are, (1) the ease of its introduction, since it squirms around all obstructions in the urethra (except stricture), and (2) the fact that the patient cannot possibly injure himself with so soft an instrument.

When a patient cannot pass his water at all, he at once recog-

nizes a need for the resort to a catheter, and calls loudly for its use, but generally for months or years before actual retention has occurred, such a patient has been suffering more or less from inability to empty his bladder properly, and would have been the better for the daily use of a catheter at least once. The rule is this: whenever, in prostatic disease, the bladder cannot empty itself entirely (though what remains over beyond the patient's efforts be only a teaspoonful), the use of a catheter once a day is called for, and the bladder should be daily washed out.

In commencing the use of a catheter the utmost care is required. Even with all possible care some inflammatory mischief is likely to be occasioned—such as an increase of inflammation of the bladder already existing, or swelled testicle; and during any such invasion the catheter must be omitted, if possible, and the inflammation treated. On resuming the instrument, with care, there is less danger of lighting up inflammatory complications.

FIGURE 142.—India-rubber bag-syringe, used for injecting the bladder through a catheter.

When a catheter is used for the first time to relieve retention, the organ may recover its power of emptying itself entirely, but it is generally wiser for the patient to continue to pass an instrument occasionally, even if the bladder can empty itself, so as to be sure that all goes well. When the catheter is used to draw urine from a catarrhal bladder, the bladder ought to be washed out at least once a day, preferably in the evening. To do this a bag (Fig. 142) may be used. It is filled with water at blood heat (just under 100° Fahr.), all air is driven out, and then the water is injected through the catheter (after the urine has all passed out) until a slight feeling of a desire to urinate tells the patient that the bladder is moderately distended. Then the nozzle of the syringe is withdrawn from the catheter, the water flows out of the bladder, carrying with it more or less mucus and pus, and the process may be indefinitely repeated until the water flows clear from the catheter, showing that the bladder is clean.

A more convenient apparatus, and one which is more easily managed when it is understood, is the fountain syringe, with a two-way stopcock. (Fig. 143.) This bag injects simply by the weight of the column of water, the force of the current being increased by raising the bag, A. The cock C is only used when it is de-

sirable to throw a medicated injection into the bladder and retain it there for a time. F is a conical nozzle which is fitted into the catheter, G, before the latter is introduced into the bladder.* I, the end of the syringe, is a large smooth piece of metal, and fits so easily into E, that the clumsiest fingers of a trembling old man can make the coupling with ease. When D is turned as represented in the picture, water from the bag runs into the bladder. As soon as the latter feels slightly distended the stop-cock is turned to a right angle with the tube (no uncoupling being necessary) and the contents of the bladder run out through H into a vessel placed to receive them.

FIGURE 143.—Fountain syringe provided with a two-way stop-cock, for washing out the bladder.

The use of this instrument is very simple. The coupling is made once for all while the urine is running through the catheter, and then by simply turning the stop-cock back and forth the bladder may be washed out as many times as desired, without any further manipulation, unless the pint of water in the bag A gives out and has to be replenished. The water placed in the bag A should have a temperature of at least 105° Fahrenheit, in order to be of a proper warmth on reaching the bladder.

The object of washing the bladder is to get rid of the last drops of urine, mucus, and pus, and to leave the organ sweet and pure. If this washing process is carefully followed out, inflammation of the bladder is prevented, and the formation of stone (a not infrequent consequence of obstructive prostatic disease) is averted. The washing should be repeated often enough to keep the bladder clean. Once a day is usually enough, but when pus forms rapidly it may be necessary to repeat the process several times.

The methods of washing above detailed are the best. A double current catheter will not answer. In order to clean the bladder it is necessary to distend it somewhat, and this cannot

* F E is made of hard rubber so as to be very light.

be done if the water escapes as rapidly as it runs into the bladder. Pure water is generally all that is required. In some instances, however, especially where there is much catarrh, medicated injections are valuable. These are to be suggested by the surgeon.

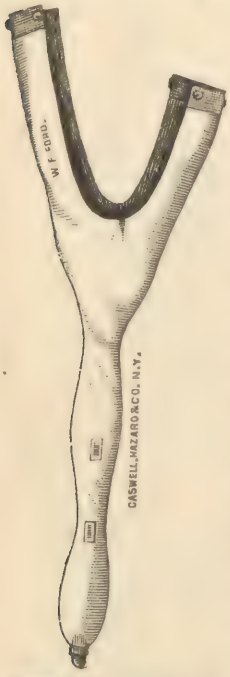

FIGURE 144.—Soft rubber urinal.

In some forms of prostatic enlargement more or less overflow will occur in spite of treatment, or the calls become so frequent as to interfere very seriously with the social comfort of the patient. Under these circumstances it becomes necessary to wear a urinal. The best urinal made is the one here represented. It is composed of soft rubber, is amply roomy, and buttons upon the suspenders. It takes in the scrotum as well as the penis, does not sweat the parts, and is perfectly safe. It should be washed out every night with a mild solution of permanganate of potash—just enough permanganate to give the water a rich purple tint. It is difficult to procure this urinal, as the rubber manufacturing companies prefer to supply smaller and cheaper patterns. They do not usually keep it in stock, but make it on order.* Any person who has worn this urinal is not likely to use any other style.

The Bladder.

The bladder is a hollow muscle running into and attached to the prostate. Elsewhere it lies free in the abdominal cavity, covered for the most part by the peritoneum, and capable of large distention without materially interfering with the action of the intestines by which it is surrounded. (See chapter on Rectum and Anus.) It may be ruptured when weakened by ulceration, or when subjected to violence while distended, but this accident is exceedingly rare and usually fatal when it does occur.

The bladder becomes paralyzed from injury to the spine, and then requires to be relieved by the catheter in the manner described on page 511, and washed out daily, or else it will certainly become seriously inflamed. The coats of the bladder may become feeble. They fail in muscular strength under certain circumstances, especially with enlarged prostate. On the other hand they become

* The Davidson Manufacturing Co., of Charlestown, Mass., does keep this urinal in stock.

overgrown and thickened in many conditions of chronic inflammation, and are then subject to violent painful spasm. There are certain tumors and unnatural growths, and cancerous and tubercular deposits found in the bladder, but these need not be described now. The conditions that call for notice here are *neuralgia of the neck of the bladder*, or irritability of the bladder, *cystitis*, or inflammation of the bladder, and *stone*.

Irritability of the Bladder.

Irritability of the bladder simply means a frequent desire to urinate where there is no sufficient cause, such as diabetes, hysteria, or local inflammation to produce the effect. This is the most common of all the maladies of the bladder. Something has been said of it under the head of neuralgia of the deep urethra. It is apt to complicate other maladies, such as stricture, enlarged prostate, neuralgia of the deep urethra, etc. In its mild form it is that condition known popularly as a "weakness," but it may go on increasing in severity until it simulates the most intense form of chronic cystitis. Between these points its variations are simply infinite.

Symptoms.—In a mild case the patient simply has a "weakness." If he sits straining at stool, he feels a desire to urinate upon arising—although the bladder may be empty. He is inclined to strain at the end of the act of urination and not to have that full sense of comfort which naturally attends emptying the bladder. Soon he begins to pass water too frequently and to have some pain or smarting during the act—especially towards its close. A dull sense of discomfort or perhaps even pain is felt deep in the urethra, with more or less pain in the back—so that the patient often supposes he has kidney disease. The testicles may feel dragged upon or painful. The expulsive power of the bladder is generally weakened at first, later, it is sometimes greatly increased into a spasmodic, painful, crampy action. The patient may believe himself impotent, and is very apt to become morbidly despondent and hypochondriacal; perhaps complaining extravagantly about some red dust (uric acid) in his urine, which he believes to be blood; perhaps equally uneasy about a white granular sediment (phosphates), which he feels certain is seminal fluid.

So long as the malady is pure irritability the symptoms are confined to the daytime. The patient may pass water hourly by day, but he sleeps through or nearly through the night. When he is pleasantly amused (in pleasant company) his symptoms lighten

up amazingly. He may be relieved for hours by a glass of beer. Bad weather, especially the east wind, makes him feel worse.

If the malady continues long enough the congestion changes to inflammation, and the patient suffers by night as well as by day; when amused as well as when brooding by himself.

Irritability of the bladder is sometimes attended by more or less spasmodic stricture, inability to pass water at will, etc.

The causes of the train of disorders above enumerated are varied. The most constant of all is erotic excitement, intense, prolonged, irregular, especially if unrelieved. Unmarried young men and widowers are the chief sufferers. Many other causes are, however, efficient in some cases to produce irritability: such as contracted meatus, strictures of large calibre, the congestion of the deep urethra left behind by an inflammation of the same region. Any of the above sets of causes are especially powerful when they act upon an individual in poor general health; especially if he be overworked and the subject of mental anxiety and depression.

Treatment.—Mild cases of irritability yield at once to treatment, but some forms of this malady cause despair to the patient and untold annoyance to the surgeon. In all cases the following rules hold good: The urine, if acid and heavy, must be modified by alkaline diluents (p. 517); if alkaline, pepsine, strychnine, nux vomica, and dilute phosphoric acid are called for. In all cases of debility, tonics, cod-liver oil, iron, quinine, vegetable bitters, are indicated, and sometimes entire change of climate and surroundings, or a sea voyage. All worriment of mind and overtaxing the strength is to be avoided. Marriage will effect permanent cure in some cases, but irregular relations often aggravate the trouble. Ungratified stimulation is very harmful. A patient with a tendency to irritability should never strain at the end of urination. Let him be content to allow the urine to dribble away towards the close of the act and immediately turn his mind upon something else, forgetting his bladder. A smooth sound passed by the surgeon at intervals of several days is often promptly curative.

Cystitis.

Cystitis, or *inflammation of the bladder*, may occur from a propagation backwards of urethral inflammation; from large doses of cantharides, and sometimes from a fly-blister; from the use of instruments in the bladder; from excessive potations, etc.; but is most often due to some sudden increase of the symptoms in some other malady which is necessarily complicated by chronic cystitis, such as stone, enlarged prostate, stricture, etc. Acute cystitis, as

a spontaneous affection, does not occur. Sometimes it is the culmination of the purely functional disorder, irritability. It is met with during all periods of life.

Symptoms.—The symptoms of cystitis are pain, heat, and smarting, felt in the region of the neck of the bladder, and often on the under side of the urethra near the head of the penis, an incessant and intolerable desire to urinate, and painful straining after passing a few drops of water tinged with blood. This pain sometimes amounts almost to a convulsive spasm, so intense is it. No relief is felt on emptying the bladder, which feels to the patient as if it were constantly and painfully over-distended. All the above symptoms may be very mild, as in a bad case of irritability, or so intense as to keep the patient howling in agony. There is no remission by night. The urine loses its bright sparkle and becomes gruelly. Sometimes it is so full of pus as to lose its transparency entirely. Blood may appear in the urine in sufficient quantities to give it a red color, or in small quantities imparting a smoky look to the fluid. When blood and pus are together in urine, the latter settles to the bottom of the vessel containing it, then a film of blood settles upon the white purulent deposit while the clearer urine floats above. The urine of cystitis is alkaline, promptly becomes ammoniacal, and decomposes shortly after its emission. Then the odor becomes offensive as well as ammoniacal, the pus changes to a thick, gluey material called "stringy or ropy mucus" which adheres to the bottom of the vessel, and there is more or less deposit of earthy salts in an amorphous and crystalline form.

Treatment.—Acute cystitis calls for three things imperatively: 1. Rest in bed. 2. Something to make the urine abundant, dilute, and alkaline, and 3. Something to quiet pain and assist the patient in overcoming the constant desire to strain at urination.

1. The patient with acute cystitis will go to bed without being asked to do so. He should have the hips raised so as to be slightly higher than the shoulders, since this keeps the pressure of the bowels from the bladder and assists in relieving the congested state of the latter by draining away the blood from its neck.

2. The urine should be made dilute and abundant, to render it less irritating to the inflamed surface in contact with which it lies, and alkaline for the same reason. It is alkaline with ammonia in cystitis, but if its natural acidity at the kidney be overcome by the use of an alkali in the stomach, it will be less acid and irritating in the bladder, and the urine when voided will be less ammoniacal; so that the apparent absurdity of giving an alkali to overcome an alkaline condition of the urine is justified by the result.

The alkali which is the most bland both for stomach and bladder is the citrate of potash. This substance is sold by the manufacturers in pound bottles. After the citrate has been exposed to the air for ten days or a fortnight it loses its peculiar odor, becomes changed to a carbonate, and ceases to be well borne by delicate stomachs, or very soothing to irritable bladders. Consequently if the citrate is bought from a druggist who does not sell his pound during, perhaps, a year, all those who are helped after the first consumer is supplied get an inferior article. Hence it is well when a patient is to take citrate of potash that he should get what he wants from a freshly opened bottle, and have his own supply put up dry in ounce bottles, wide-mouthed, and tightly corked. He uses his ounce in a week at the farthest, and the medicine remains good to the end. When the citrate is taken in this manner the druggist puts up a twenty grain powder as a sample, and the patient takes a like amount from the bottle at each dose, dissolving it in a claret-glass of sweetened cold water, or of one of the diluents about to be mentioned. The dose should be taken about one hour before each meal and on going to bed.

Diluents are very numerous. Among the best are teas made (one or two ounces to the pint) from the leaves of the Bear's foot (*Alchemilla vulgaris*), Buchu (*Barosma crenata*), Red Bearberry (*Uva ursi*), *Pareira brava*, the root of Dog's-grass (*Triticum Repens*), or from the stems of cherries. These may be used freely, or teaspoonful doses of their fluid extracts in water may replace them. The uva ursi and pareira brava are most stimulating. The balsam of copaiba is very soothing in some cases—where the stomach can retain it. Bethseda, Buffalo Spring, and Vichy mineral waters are serviceable.

FIGURE 145.—Hot-water bottle of India-rubber. Having a screw-cap, an India-rubber funnel attached to the neck, and a tag with islet-hole, by means of which and the handle, a cord can be used to keep the bottle in place.

3. Anodynes are absolutely necessary in the treatment of acute cystitis. The man with an inflamed bladder who urinates every few minutes and then strains violently, is in the same situation as the man with an inflamed eye who rubs the tender organ constantly with his fist. The patient cannot help straining unless prevented by the soothing influence of an anodyne, and the empty bladder therefore squeezes itself, and does itself constantly increasing damage. The quality and quantity of the anodyne to be employed should be decided by the surgeon. The patient is not a proper judge.

An excellent domestic anodyne applicable to all cases of acute

and chronic cystitis, is heat. The best manner of apply'ing heat is with the flat rubber bottle containing a thin film of very hot water. This is better than a poultice. It is dry and clean. It should be placed across the lower part of the belly and its action may be enhanced by placing upon the skin beneath the bottle a piece of moistened paper sprinkled with dry mustard.

Catarrh of the Bladder.

This is chronic inflammation, in which the discharge of stringy mucus forms a prominent feature, whence the popular name, Catarrh. The malady, catarrh, is never spontaneous, but depends upon obstructive disease of the urethra or of the prostate, stone in the bladder, muscular weakness, or upon prolonged neuralgia of the neck of the bladder, or degenerative disease in this region; upon irritative disease of the kidney acting in a reflex way, and occasionally upon irritative disease of the testicle. In other words essential chronic inflammation of the bladder does not occur as a special disease: it is always a symptom of some other morbid state. The patient is rarely able, unaided, to decide what the particular malady is of which the catarrh is a symptom. For this diagnosis he seeks a surgeon.

The natural termination of catarrh of the bladder is by the gradual development of chronic disease in the kidney.

Symptoms.—The symptoms of catarrh of the bladder are the same as those already set down for acute cystitis, except that they are more moderate in character. The urine is more or less ammoniacal, the stringy mucus, the pus, the pain, the frequent urination, are all prominent in varying intensity, according to the grade of the inflammation. With stone in the bladder and stricture, the frequency of the calls to urinate is greater by day; with enlarged prostate, by night. During catarrh of the bladder, on account of exposure to cold, violent exercise, or other cause, or it may be spontaneously, the symptoms may become suddenly intensified, and the whole attack becomes one of acute cystitis, which, subsiding, leaves the bladder in the same chronic state of inflammation as before.

Treatment.—If the cause cannot be removed (as is often the case), palliative treatment may still afford the patient great comfort. The symptoms of catarrh of the bladder are to be treated on the same general principles as those of acute cystitis, viz., by rest, alkaline diluents, and anodynes; the strength of the remedies employed being proportionate to the intensity of the symptoms.

Besides these means, medicated injections of the bladder and simply washing out the bladder, in the manner detailed on page 512, are of immense service in keeping down the symptoms. The catheter must be employed with great gentleness, for fear of exciting acute symptoms, and simple warm water be used at first for washing until the bladder has become accustomed to manipulation. Then various medicines may be advantageously employed as injections, such as chlorate of potash, two drachms to the pint of water; or borax, half an ounce to the pint of water, increasing the strength according to the effect. Stronger injections must be left to the surgeon, as well as the use of nitrate of silver, and the desperate remedy, *cystotomy*.

Retention of Urine.

This condition calls for the catheter, or for aspiration or puncture of the bladder, if a catheter will not enter by the natural route. The management of retention and suppression necessarily falls to the surgeon and does not need to be discussed here. It is well, however, to make this point: retention, when it once happens, is apt to recur, so that it is wise for a patient, liable to have retention, to understand clearly the cause of his inability to make water and the best means of relief, and to have such a form of catheter (preferably of silver), among his effects as will suit his peculiar case. In this way, if caught with retention on a journey—a not infrequent accident—he may escape much needless exploration (and possible damage) at the hands of a new surgeon.

Gravel.

As affecting the bladder there are two kinds of gravel: the red and the white. The former is the brick-dust deposit and red sand so common among gouty and rheumatic patients. This form of gravel tends to keep up irritation of the bladder and urethra, and leads directly to stone. Patients suffering from it should drink freely of water between meals and on retiring; eat plenty of fruit, vegetables, and bread, avoiding much meat, and alcohol in all its forms. Considerable exercise and an out-door life are advisable, as are also great regularity of habits and attention to digestion. Vichy and other mineral waters, and alkaline diluents make the red sand disappear, but do not overcome the tendency to its re-formation.

The white (or phosphatic) gravel is a mortar-like dust which appears in the urine, chiefly at the end of the stream (more espe-

cially when the bladder is emptied at about two hours after breakfast). It is usually mistaken by the patient for seminal fluid or for pus. Urine containing it scums over with an iridescent pellicle soon after cooling, and goes rapidly into decomposition. Such urine has a peculiar chicken-broth odor.

Phosphatic urine is often accompanied by a tendency on the part of the patient to melancholy, to despondency of disposition, pain in the back and in the head, to neuralgia and dyspepsia. Such patients are apt to be nervous, impressionable, easily upset, and of rather low vitality as a rule. Most of them bother themselves incessantly about their urinary sediments, and magnify all their accidental urinary and other symptoms to a very unnecessary extent. Yet phosphatic urine is compatible with perfect health. Many patients have it and are unconscious of its existence. It is sometimes so considerable that the spatterings of the last drops of urine, charged with earthy phosphates, falling upon the shoes look, when they dry, like spots of whitewash. Overwork, especially worry of mind, decidedly increases the proportion of phosphates in the urine. Students who sit up all night preparing for an examination, are pretty sure to have their urine full of phosphates in the morning. It settles like a white gruelly dirt in the chamber, while the characteristic, many-colored, oily scum quickly appears upon the surface of the fluid. [See page 488, for other references to this subject.]

Treatment.—Great excess of acids, vegetable or mineral, will cause phosphates temporarily to disappear—but they return again. The best treatment is a regulation of all habits, attention to digestion, an animal diet, much air and exercise, avoidance of care, overwork, and worry, such tonic medicines as may be called for and found to agree, pepsin, iron, quinine, etc. Smoking and chewing tobacco are especially harmful for those having a tendency to phosphatic urine.

Stone in the Bladder.

Stone is large gravel. It forms in the bladder either by crystallization of urinary salts spontaneously (when the mother liquid is sufficiently dense and there is a rough surface on the bladder-walls), or more often upon a nucleus such as a few crystals or a small stone which has come down from the kidney and not escaped by the urethra, or upon a clot of blood or mucus, or a foreign body (pistol ball, piece of bone, etc.) which may have entered the bladder from without. A great majority of all stones found in the bladder are composed of uric acid; others are phosphatic, mixed

phosphates and urates, oxalate of lime, etc. They are encountered at all periods of life from the earliest childhood to extreme old age. The younger the subject the more certain is the stone to be hard and of uric acid; the older the patient the more apt is the stone to be soft, composed of the phosphates, and secondary to preëxisting bladder disease. The tendency to stone is inherited. In some portions of the country stone is a common malady (Kentucky). In and around New York it is comparatively rare. The hardness of the water used for drinking purposes is not the cause of the frequency of stone. The real cause has not been determined.

Symptoms.—The symptoms of stone in the bladder are those of chronic inflammation with occasional acute outbreaks (attacks of "the stone"). Besides the ordinary symptoms of inflamed bladder there are a few extra ones, rather characteristic of stone. Exercise increases the pain greatly. Blood in the urine is of frequent occurrence. The stream of urine is apt to be cut off suddenly while flowing at full force (as the stone is washed up like a valve against the neck of the bladder), and this short, full stop is attended by great pain which runs down the penis and is most keenly felt near the end of the member, or at a point about three-quarters of an inch from the orifice of the urethra upon the under surface of the penis. The stream may flow on again in full force after such an interruption, but violent straining and pain are felt after the end of urination, the last drops of the fluid being often tinged with blood. The end of the penis feels itchy and irritated in some cases of stone, and there is a strong tendency, especially in the case of children, to pull at the end of the prepuce. In this way children often innocently acquire the habit of self-abuse. In many cases of stone, especially when the patient is an old man, the symptoms are simply and solely those of catarrh of the bladder, unmodified; and in some cases of prostatic disease all the symptoms of stone are present, but no foreign body exists in the bladder. The most distinguished surgeons have cut patients for stone and found none, while other sufferers have been allowed to die with a diagnosis of cancer of the bladder (or some other disease), when a post-mortem examination has revealed stone to be the cause of all the symptoms. The only certain diagnosis of stone is for the surgeon to strike the foreign body in the bladder with an instrument (sound) passed through the urethra.

Treatment.—The treatment of stone is 1, Palliative—as for catarrh of the bladder, where chronic disease of the kidneys makes an operation inadmissible, or 2, Radical, preferably by *lithotrity*—finally by *lithotomy*. In the former of these operations the surgeon crushes the stone with an instrument passed through the

urethra, and either washes out the fragments through a catheter at once, or the patient passes them out while urinating. In lithotomy a hole is cut into the bladder and the stone extracted with forceps. Lithotrity is by far the safer operation. In the case of elderly people the mortality of lithotrity is trifling as compared with that of lithotomy. The cutting operation is very safe and more applicable in the case of children. According to statistics of Sir H. Thompson, of England, which are the most reliable on record, the mortality for the crushing operation in old people is about 1 in 13, while that for the cutting operation in patients of the same period of life is more than 1 in 3.* Where the age of the patient or the condition of the kidneys contraindicates any operation, the patient's life may often be made very comfortable, but a cure is, of course, impossible. Rest, the free use of water, washing the bladder (page 512), and the employment of the means advised in the treatment of chronic cystitis (page 514), constitute the best means for alleviating the patient's sufferings.

It is folly to attempt to dissolve stone in the bladder either by medicines thrown into it, or taken by the stomach. All such means have been patiently tested by the profession and discarded.

Tumors in the Bladder.

Tumors give rise to symptoms of irritability of the bladder at first, then to signs of chronic, and finally of acute cystitis. *Villous tumor*, a soft vascular growth sometimes encountered in the bladder, is especially characterized by its tendency to produce recurrent profuse hemorrhage. The palliative treatment for tumor of the bladder is that of cystitis—removal of the growth can only effect a cure. This is sometimes practicable, often not so.

Diseases of the Testicle and Cord.

Under this head it is necessary to consider briefly the question of masturbation. No subject requires to be dealt with more honestly or more boldly in a work intended for the general public. Mystery on such a topic is folly, and that sentimentality is false and criminal which induces a writer to roll up his eyes and mourn the weakness of fallen humanity, and to mouth out his regrets that some people can be so depraved and shameless as to pollute themselves, and to yield to that perverted sexual instinct which leads to masturbation. It is this quality of false sympathy in writings and

* Report before the Royal Medical and Chirurgical Society, in February, 1878.

advice to the young which feeds the evil it assails, and leads to its continuance by attacking the patient as if he were a culprit, and were to blame in the matter, when really he is the victim of a natural instinct. The nastiness of the thing and its unmanliness are not brought out. The real issue is shirked. The father hangs his head, beats around the bush, and tries to intimate to the son what he is driving at in giving advice on these subjects. The son sulks and hangs his head, and although perfectly certain of the meaning of his father's intimations, he pretends to an innocent ignorance of what his father is talking about, and when finally, by a heroic effort, an understanding between the two is reached as to what the subject under discussion really is, the innocent son lies about it and the simple father believes him—or perhaps, rather, persuades himself that he believes him—thanks heaven he has so good a son, and, dropping the subject, tries to feel satisfied.

A very common method of attempting to prevent masturbation or to correct the habit where it exists, is through the instrumentality of fear. But this is stupid absurdity. Did fear of hell alone ever make a true Christian? The body cannot conceive what it is to be ill while it is in good health. Sickness does not exist for the well man except as a name. Moreover, the picture which is painted of the terrible weakness of body and mind so certain to be produced by the secret vice is generally overdrawn. The boy cannot take it in and appreciate it. He is terribly frightened at first, struggles hard for a while, and then gives way; for the emotion of fear alone must yield, and cannot hold against a strong natural instinct. Then, after the fall, the boy finds that no harm comes to him, and he begins to think that he will be an exception to the rule. He goes on until he has been really injured, perhaps, to a very slight extent, and then he magnifies the possibilities of his misfortune by recalling all the terrors painted for him years before by some over-kind adviser, and he becomes a hopeless victim to melancholy and hypochondria, not on account of his masturbation so much as from the terrible results of prolonged nervous apprehension, due to brooding over what he remembers of the advice given to him when he was young, and to the books upon the subject which he has read since.

A right-minded boy is capable of very noble sentiments, and generally possesses more reason than we give him credit for, while his perceptive faculties are vastly superior to those of his elders. It is better, therefore, to help him by assisting what is noble in his nature rather than to attempt to bully him by a base appeal to his fears.

The same sexual instinct that will drive an animal through fire

and water to the death perhaps, and a man through folly to disgrace, unless controlled by reason, will, as certainly as fate, lead a boy to masturbation by one means or another unless in his case also controlled by reason. Fear is powerless to hold a boy, blame urges him on, and sympathy destroys whatever resistance his own common-sense might have furnished him with.

The sexual instinct buds in a boy. He does not know why; he cannot understand it at first. If much alone he stumbles by accident upon some unnatural means of gratification; if with other children, some one teaches him, and the boy becomes a victim to accident or to vice. Babies and young children are sometimes abused by their nurses, and indeed there are so many routes leading to the same result, that it is wonderful how any one escapes, as some few certainly do.

The only safe course in the management of male children is to assume that they all trifle more or less with themselves—or at least that they will do so unless precautions are used to guard against it. And what shall these precautions be? Sleeping on hard beds, taking cold local baths, medicines, motherly sympathetic counsels, fatherly threats? No, none of these. The child must be recognized as a reasonable human being. He must be taught to look his instructor in the eye and to tell the truth. He must be encouraged to be manly and straightforward in his whole life. Out-door sports must occupy a large portion of his thoughts, and athletic exercises a reasonable amount of his time. He must go to bed at a regular hour when tired out with his daily duties, and he will sleep at once, and he should not be allowed to lie in bed in the morning. He should not be left much to himself or with older boys if it can be avoided, or with older girls. But particularly should he be encouraged to free interchange of thought and opinion with his father, and no subject should be denied respectful consideration. The relation of the sexes, as sure to be observed by a boy among animals, should be discussed in the same way that the planting of trees is talked of, but in the general spirit that regulates discussion upon such physiological acts, for instance, as the movements of the bowels or the action of the kidneys. If, finally, there is reason to suspect that the boy is abusing himself, from any evidence offered by a tendency to slink away by himself, to lose his bold, boyish honesty of physical expression, to droop, to get morbid and have fancies, then he should be talked with plainly, not scolded, not sympathized with, not terrified, but shown the dirtiness of his tricks and shamed out of the unmanly nastiness of trifling with a noble function, which trifling may injure him, perhaps, to some extent in body, but certainly will do so in his own self-respect. It is wrong for him to

practise this habit, just as it is wrong for him to strain his eyes, to over-eat, to steal, or to lie. Decent people do not do these things, and this particular vice is peculiarly apt to do some harm, sooner or later, because it involves a shock to the nervous system—the most sensitive and delicate of all our structures. The *morale* of the patient, however, suffers more than anything else.

Excess in masturbation, like excess in sexual intercourse, *does* lead to positive physical and intellectual decay, but the number of people who suffer from these causes is very small. Much evil resulting from other causes is ascribed to the excesses above mentioned. They are blamed for what they never did. Therefore, while recognizing that excess in any direction is dangerous (especially if it involves the nervous system), it is necessary to enter a protest here against the hypochondriacal complainings of nervous patients, chiefly with phosphatic urine, who ascribe to a certain amount of masturbation in early life untold imaginary evils from which they think they suffer in their later youth and early manhood. Such patients are generally unbalanced in mind. They stimulate erotic fancies in various ways, and are really suffering from being in an unnatural state. Unappeased sexual needs, which they wilfully create, is the true name, very often, of their malady, and its cure is common-sense, hard work, and a respectable marriage.

Varicocele.

Varicocele is a dilated condition of the veins of the spermatic cord. It occurs nearly always on the left side and feels like a bunch of earth-worms in the scrotum. The left testicle naturally hangs lower than the right, and is a little larger than its fellow. The veins on the left side are longer, empty into the kidney-vein, and their circulation is influenced by constipation on account of their proximity to the end of the lower bowel. These causes are supposed to account, in the main, for the fact that varicocele of the left side is common, and of the right side very rare. Great numbers of people—especially young unmarried men—have more or less varicocele in the left side. As a malady it is unimportant, and generally disappears for the most part after marriage. When it is attended by great pain in the testicle or by wasting of the testicle, it calls for treatment.

Treatment.—Treatment is palliative or radical. The former is by far the better, and consists simply in the use of a well-fitting suspensory bandage. When matters get to such a pass that a radical operation is called for, the case passes into the surgeon's hands.

Operations are objectionable on two accounts :—1. If absolutely all the veins are cut away or tied, the testicle wastes away. 2. If too many of the veins are left, these may in their turn become varicose. A very good operation, in case of need, is to cut away a portion of the scrotum, thus forming a natural suspensory bandage, by shortening the bag.

Swelled Testicle.

This malady generally occurs in consequence of some inflammatory disturbance of the urethra (urethritis or stricture) or as a result of instrumentation (explorations and operations upon the urethra and bladder). It *may* occur as a direct result of cold, or injury—but very rarely. In ordinary swelled testicle the back part of the organ or *epididymis* is involved. The whole gland swells somewhat, and some fluid is effused into the cavity of the *tunica vaginalis*—the little serous sac which surrounds the testicle in order to allow it to slip away easily from pressure and avoid injury. The greater amount of swelling and pain in these cases, however, is experienced at the back part of the testicle.

Symptoms.—Generally the actual swelling of the testicle is preceded by a dragging pain in the groin for some hours. When the testicle actually begins to swell, this pain may cease or may become intensified. The testicle swells pretty rapidly. The scrotum over it gets red and hot. The pain is often intolerable, of a sickening sort, sometimes culminating in positive faintness and nausea. Most patients are unable to walk about with an acutely swelled testicle, on account of the intensity of the pain. First attacks are the most intense. If there be any urethral discharge when swelled testicle commences it gets promptly better, but returns when the inflammation in the testicle begins to subside. The bowels become confined, the tongue gets coated, and the stomach upset during an acute attack of *epididymitis*.

Treatment.—The treatment of this malady is very simple. The testicle should be slung up in a handkerchief attached to a bandage around the waist, so that all weight is taken off the cord. The patient must go to bed, and a poultice made of tobacco (one paper of fine-cut to the pint of water, with ground flax-seed enough to make a poultice) should be snugly applied from the start upon the elevated testicle until the latter becomes narcotized and the pain ceases. Cold applications are not generally applicable ; the poultice should be used from the commencement. It is very dirty, surely, but it is safe and effective, and a cleanly person can keep himself clean in spite of it. A plaster of opium and glycerine will do as

well, but it is dangerous, which the tobacco is not—for adult men. Daily evacuations of the bowels are necessary, and rest in bed until the patient can stand up without pain in the testicle, when the latter is allowed to hang down unsupported. This takes from one or two to twelve days, according to the intensity of the attack. A mild anodyne may be necessary for a day or two, but afterwards no medicine is of any especial value. Puncturing the testicle is brilliantly effective, but sometimes dangerous, and the merits of tincture of pulsatilla, lately vaunted, have yet to be proved.

This malady generally leaves the testicle perfectly healthy. Prolonged or recurrent attacks, however, or simple attacks in weakly persons, or those with a tubercular tendency, may lead to a permanent blocking up of the tube leading from the testicle, and to subsequent sterility (not impotence) if both sides be affected. The prospect of such a possibility gives the malady a respectability it would not otherwise have, and is the strongest argument to induce a sensible patient to go to bed at once when he gets any painful swelling of the testicle, so as to get well as quickly as possible and be left a sound man.

Orchitis.

This malady is inflammation of the secreting structure proper of the testicle. It occurs sometimes spontaneously in an acute way. It is the malady of the testicle seen in connection with mumps, and is the kind of swelled testicle most apt to result from local injury. The pain in orchitis is intense, and often of a peculiarly sickening character. A chill may precede its outbreak. The natural terminations are in resolution, atrophy, or abscess. The first two occur in the spontaneous variety of orchitis, and in that seen with mumps. Abscess is not often seen except after local violence.

Treatment.—Orchitis is to be treated on the same general principles as epididymitis, except that where the inflammation runs high, and strangulation of the testicle from lack of extensibility of its investing membrane seems imminent, incision of the *tunica albuginea* (investing sheath of the testicle) may be practised by the surgeon with good effect.

Hydrocele.

Hydrocele, or dropsy of the testicle, is a common malady. It is simply a distention with fluid of the sac which surrounds the testicle (the *tunica vaginalis*). Hydrocele is due to a variety of

causes, but mainly occurs in connection with slight irritative inflammatory states of the urethra (stricture, etc.) Hydrocele may be very small, not seriously incommoding its bearer, or may reach an enormous size. The historian Gibbon is reported to have had a hydrocele which contained six quarts of fluid.

In hydrocele the testicle assumes a pear-like shape, larger below, and of a size proportionate to the amount of serum within the cavity of the tunica vaginalis. Little or no pain is felt in the swelling. There is no heat or redness of the skin over it, and the malady is only distressing, according to its size, by its weight, which drags upon the cord. A suspensory bandage generally relieves this discomfort until the patient is ready for operation. On pressing a hydrocele the sensation of pressure upon the testicle is felt when the mass is squeezed about half way up posteriorly, where the testicle usually lies. The translucence of the swelling is the main diagnostic test. This is observed by letting strong sunlight fall upon one side of the swelling, or holding a candle there while that portion of the tumor nearest the observer is made tense and is shaded with the hand and the eye applied as if to look through the upper part of the swelling. If there be fluid in the *tunica vaginalis*, not purulent or bloody, and the walls of the sac be reasonably thin, the swelling is noticed to be distinctively translucent. The extraction of a few drops of clear fluid with an exploring-needle completes the diagnosis.

An old hydrocele is apt to have thickened walls, and may contain pus or blood. Encysted hydrocele is one of the special varieties.

Treatment.—This malady is perfectly curable by puncture, injection, incision, seton, or other surgical means, which need not be detailed here. Medicine does not affect it.

Tumors of the Testicle.

The testicle is affected by tubercular and cancerous deposit, by cystic degeneration and syphilis, etc., making a variety of chronic swellings, some of them painless, others painful, difficult of diagnosis, and not capable of thorough explanation in the brief limits of this article.

The tubercular testicle may be perfectly cured, as may the syphilitic. Cancerous, non-malignant, and cystic tumors of the testicle do not get well under any treatment, and require a removal of the gland, an operation simple in its performance, and effective in its result if the disease does not return.

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Diseases Peculiar to Women.

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DISEASES PECULIAR TO WOMEN.

INTRODUCTION.

It is not intended or expected that, after reading this chapter, women will be qualified to attempt the treatment of the various maladies peculiar to their sex. On the contrary, it is rather designed to awaken in them a proper sense of the importance of these diseases—more frequently neglected than over-treated—and to call attention to the significance of certain symptoms of disordered health so pointedly as to show the necessity of timely resort to skilful medical aid.

It will also be attempted to indicate such simple rules of prevention and management as a physician should impart to a patient who might not be able to obtain skilled services promptly when needed, or which are suitable for the domestic management of ailments which should be understood by all intelligent women.

ANATOMY AND PHYSIOLOGY OF THE FEMALE ORGANS OF GENERATION.

In order that the diseases of any organ of the human body may be understood, a knowledge of the location, structure, and use of such organ in a state of health is absolutely necessary. Hence, anatomy and physiology have always been properly regarded as the basis of all correct medical learning. In view of this fact, I will preface my remarks on the diseases of women with a brief account of the female organs of generation.

The female generative organs are divided into the external and internal. The external consist of those which are chiefly concerned in coition, and the internal of those whose uses are the development, nutrition, and expulsion of the ovum. The external sexual organs comprise the mons veneris, labia majora and minora, clitoris, hymen, carunculæ myrtiformes, and perineum. These are known collectively as the *vulva*.

The *Mons Veneris* is situated at the extreme lower portion of

the abdomen in front of the pubic bone. It consists of a prominent triangular cushion composed of fatty and connective tissue, covered with a thick integument which, at maturity, becomes studded with a growth of short, crisp, curling hair.

Of similar structure with the mons veneris, and extending downward from it on either side, are the *Labia Majora*, or larger lips of the vulva. At puberty they also are covered with hair, but more scantily than the mons veneris. These lips are full and large, and they lie in contact with each other at their upper part, but they become thinner and are separated as they pass downward and backward. Externally they are covered with skin, but their inner surface is lined with mucous membrane, which structure, commencing at this point, passes inward, lining all the genital and urinary organs. The internal surfaces of the labia majora are furnished with numerous little glands which secrete a fatty and odorous substance. The junction of the labia majora in front is called the *anterior commissure;* and that below, the *posterior commissure*, or *fourchette*. The posterior commissure forms the anterior boundary of the *perineum*.

Situated between the labia majora, and about one inch below the anterior commissure is the *clitoris*, the analogue of the male organ, which it greatly resembles, although in miniature, being only about one inch in length. It differs also from the male member in being imperforate. It is capable of erection and is thought to be the principal seat of sexual sensibility. In some cases of disease it remains constantly erect, giving rise to great suffering and making it difficult or even impossible to pass urine. The only part of the clitoris which is visible is its glans or head, the body of the organ lying behind the pubic bone and being covered with mucous membrane. A portion of this latter forms a small hood-like fold which partly covers the glans also, and which is called the *prepuce* of the clitoris.

Arising from the prepuce of the clitoris, and sometimes from the glans, and extending downward on each side, are the *labia minora*, or lesser lips, sometimes called the *nymphæ*. They each consist of a thin fold of mucous membrane, and are about an inch to an inch and a half long. On their inner surfaces are found the openings of numerous follicles which pour out mucus for the lubrication of the parts.

Extending downward from the clitoris, between the labia minora, is a smooth, grooved, triangular space called the *vestibule*, at the lower portion of which, about one inch from the clitoris, is the *meatus urinarius*, or external opening of the urethra, the passage leading to the bladder.

The meatus consists of a puckered rim of mucous membrane, somewhat elevated above the surrounding parts. It is through this opening that the catheter is passed into the bladder in cases of retention of urine.

Immediately below the meatus urinarius is the mouth of the va-

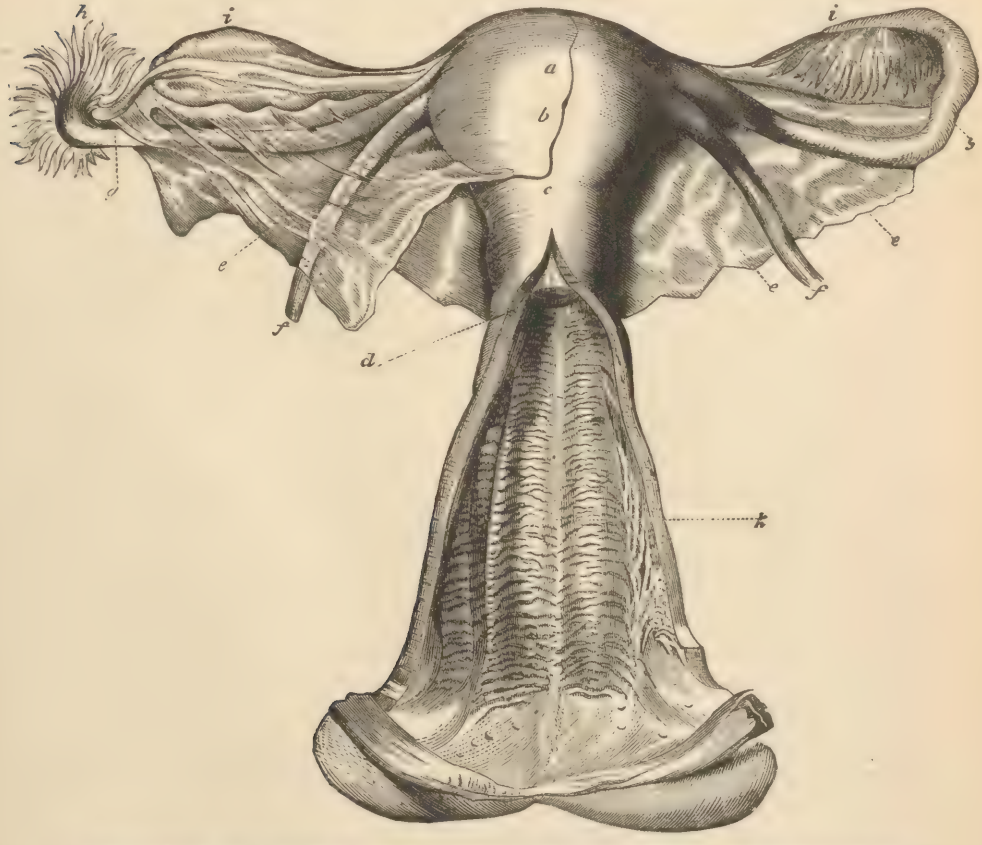

FIGURE 146.—The female organs of generation seen from in front after removal from the adjoining parts. The vagina has been laid open by an incision through its front wall. *a*, the body of the uterus; *b*, the divided edge of the peritoneum which has been removed from the organs on the left side (right side of the figure); *c*, the cervix, or neck of the uterus; *d*, the os or mouth of the uterus projecting into the vagina; *e*, *e*, the broad ligaments which pass sidewise to the pelvis and support the uterus laterally; *f*, *f*, the round ligaments connecting the uterus with the pubis; *g*, *g*, the Fallopian tubes; *h*, the fimbriated or fringe-like extremity of the Fallopian tube of the right side; *i*, on the right side, the ovary; on the left side the fringed extremity of the Fallopian tube is closely applied to the surface of the ovary as occurs when an ovum is discharged; *k*, the vagina.

gina, of an oval shape, and varying in size according to age, childbearing, etc. In the maiden this opening is partly closed by the presence of a membranous fold of crescentic shape called the *hymen*. It was formerly thought that the existence of this portion of the

body was a proof of the chastity of the woman, but this notion is no longer entertained, since it is now well known that it is sometimes entirely wanting, either from defective development or by accident. This membrane is usually ruptured at the first sexual approach, but not always ; for in some women it is so yielding in texture as to remain unbroken after frequent intercourse. On the other hand, it may be so thick and resisting as to afford an effectual bar to sexual congress, and require a surgical operation for its division.

After rupture of the hymen, its place is occupied by a number of little bodies consisting of duplicatures of mucous membrane, which, from their supposed resemblance to myrtleberries, have been termed *carunculæ myrtiformes.*

Situated between the fourchette and the opening of the bowel is the *perineum.* In its ordinary state it is about an inch and a half in length, but is capable of great distention, and during the passage of the child's head in labor it is elongated to the extent of four or five inches and widened almost as much.

The internal organs of generation are the vagina, uterus, Fallopian tubes, and ovaries.

The *vagina* is a curved canal leading from the vulva to the uterus. Its anterior wall is about three and a half or four inches long, and the posterior about one inch longer. It becomes shorter after childbirth. Its average diameter is about an inch or an inch and a half, being largest at the upper end and smallest at the outlet. Usually its walls are in contact and it thus prevents the access of air to the uterus. Its lining membrane is thrown into numerous transverse folds or rugæ, which are much more distinct in virgins than in women who have borne children. The use of these rugæ is to permit the distention of the canal during labor. The mucous membrane secretes a lubricating fluid having an acid reaction which, under some circumstances, constitutes the discharge known as leucorrhœa, or "whites."

The *uterus*, or womb, is situated in the centre of the pelvic cavity, between the bladder in front and the rectum, or lower portion of the intestine, behind, and having the vagina below and coils of intestine above. It is maintained in this position by various ligaments and attachments of cellular tissue to the other pelvic organs. In shape, the uterus has been compared to a pear somewhat flattened from before backward. It is about two and three-quarters inches in length, one and a half inches wide at its broadest part, and one inch thick. Anatomically, it is divided into a *body* which constitutes its upper portion, and a *cervix*, or neck, which is the lower portion. The highest part of the body is called

the *fundus*, and the extreme lower portion of the cervix opening into the vagina, is the *os uteri*, or mouth of the uterus. The body and cervix are traversed by a canal, which, in the former, is expanded into a cavity. The interior of the uterus is lined by mucous membrane, which is continuous with that of the vagina.

The os uteri in the virgin is a transverse slit or fissure capable of admitting a small goose-quill. In women who have borne children it becomes more oval in form, and in old age it is circular and smaller, with sharp, hardened edges. The os is bounded by two lips, an interior and posterior. The anterior is the lowest, owing, chiefly, to the axis of the uterus being at a considerable angle with that of the body ; thus, a line drawn from the os uteri through the fundus of the organ, would strike the navel in front and the extreme lower part of the spine (the coccyx) behind.

The canal of the neck of the womb is spindle-shaped, being narrowed at the os uteri, and still more so at the point where it connects with the cavity of the body, this point being called the internal os uteri. The mucous membrane which lines this portion of the womb, presents a very peculiar appearance when the canal is laid open. It is disposed in four columns of folds resembling the printed lines in a book. The spaces between these folds contain thousands of mucous follicles which secrete the mucus designed to lubricate the parts. In a state of disease this mucus is sometimes discharged in enormous quantity, constituting a frequent form of leucorrhœa.

The cavity of the body of the uterus is triangular in shape, the base of the triangle being above, and the apex at the internal os uteri below. The two upper angles mark the points where the Fallopian tubes enter the uterus. The mucous membrane here has a very complex structure, is studded with glands, and is now generally admitted to be the chief source of the menstrual discharge.

The *Fallopian tubes** are two in number. They are about four inches long, and extend from the upper angles of the womb outward on each side towards the brim of the pelvis. They vary in thickness from one-eighth to one-quarter of an inch. They are pervious throughout their entire length ; the canal being lined by an extension of the mucous membrane of the uterus. The abdominal end of each tube terminates in a curious structure called the *fimbriated* or *fringe-like body*, in the centre of which is the internal opening of the tube. It is the function of the Fallopian tube to convey the ovum or germ from the ovary to the uterus. In order to do this, the fimbriated extremity of the tube, although

* Named after the anatomist, Fallopius, of Italy.

to a certain extent floating loosely in the pelvic cavity, applies itself accurately to that part of the ovary from which the ovum is about to emerge, and receives the latter into its opening, whence it is transmitted to the uterus. In case the ovum is impregnated, it remains in the uterus throughout the period of gestation ; otherwise, it passes on through that organ, and thence out of the body.

The *ovaries* are two flattened ovoid bodies situated on either side of the uterus. They are developed between the layers or folds of the broad ligaments.* They are about an inch to an inch and a quarter long, three-quarters of an inch broad, and half an inch thick. In structure, they consist of a reddish-white substance containing numerous small bodies varying in size from a pin's head to a small pea. These latter are called *Graafian follicles.*† It is in these follicles that the ovum is matured. In the ovary of a woman, after the age of puberty, there can usually be seen with the naked eye from ten to twenty of these follicles in different stages of development, the largest being found nearest the surface of the organ. The stroma, or proper substance of the ovary, is surrounded by a dense fibrous tissue, called the *tunica albuginea* (or white tunic). [See also chapter on OBSTETRICS.]

Connected with the uterus and attaching it to the bladder, rectum, etc., are a number of ligaments, a description of which is hardly necessary here.

Menstruation.

About the age of fourteen to fifteen years—sometimes a year or two earlier, sometimes later—a remarkable change is observed to take place in the human female ; a change which affects her bodily, mentally, and morally. At this interesting and important period she ceases to be a child and becomes a woman. This change is designated by the term *puberty.*

During the progress of this process the pelvis enlarges, the hips are expanded, the organs of generation are rapidly developed, the breasts become fuller, the limbs assume a plump and rounded form, the entire figure loses the angular and awkward outlines of girlhood and becomes graceful and beautiful. The girl's manners and habits also undergo a marked change. She discards the doll that she played with but yesterday ; she feels that she is no lon-

* A fold of the peritoneal membrane which covers the uterus, and passes outward on either side to the walls of the pelvis.

† After a Dutch anatomist, de Graaf.

ger a child, and that new duties and responsibilities devolve upon her. She is no longer wayward, romping, and careless, but becomes reserved and modest in her deportment. In short, she is now a woman, prepared to love and be loved, and capable of performing the highest and most important functions of her sex.

Simultaneous with these changes—sometimes at their very commencement—there occurs a most interesting and remarkable function of the female economy, viz., *menstruation.*

By the term menstruation is understood a discharge of blood from the female genital organs occurring at intervals of about twenty-eight days, lasting from three to five days, and continuing to return periodically, unless interrupted by pregnancy, suckling, or some disease, to the age of forty-five or fifty years.

Owing to a variety of circumstances there is very great irregularity as to the time at which menstruation commences and ceases. For example, it is hastened by a residence in a hot climate, by the use of warm and stimulating food and drinks, frequent bathing in warm water, sleeping in warm, soft beds, luxurious habits of living, etc. It is also accelerated by certain moral influences, as an early entrance into society, balls, theatres, music, painting, the reading of exciting romances, etc. The artificial maturity induced by these and similar agencies is always to be deprecated, for the result is very likely to be a lasting injury to the system.

The approach of menstruation is commonly marked by various irregular nervous symptoms, as irritability of temper, fits of crying, disturbed sleep, capricious appetite, headache, flushings of the face, palpitation of heart, pains in the back, loins, etc. These manifestations may disappear after two or three days to reappear at the end of a month, or, possibly, after some indefinite interval. Finally, they are followed by the appearance of a colorless mucous discharge from the genitals, which, in its turn, is succeeded by a flow of blood. The first menstrual flow usually lasts from one to three days. The function does not in most cases become regular at once; an interval of two or three months, or even more, elapsing sometimes between the first and second discharge.

The quantity of blood lost at a menstrual period varies very greatly, so that it is impossible to fix a definite healthy standard. Some women do not lose more than two or three ounces, while others habitually lose eight or ten ounces; and these quantities may therefore be regarded as within the limits of health. Nevertheless, the smaller quantity named would be regarded as scanty by the latter, and the larger quantity would be a profuse flow for the former. Indeed, in regard to the amount of the discharge, the

length of the periods, and the intervals between them, each woman is a law unto herself.

At about the age of forty-five to fifty years the function of menstruation ceases; and with it ceases also the reproductive power of women. This period has received the significant name, *Change of Life*. It is also known as the "Turn of Life," "Climacteric," etc. It is an extremely interesting and critical period of a woman's existence, and one which is fraught with important consequences; for, according as it is passed with safety or otherwise will her future health be. Sometimes, though rarely, the discharge ceases at once, to return without any preceding irregularity; and when it does so, there is frequently much doubt as to whether the non-appearance of the flow at the customary time may not be due to pregnancy. Usually, however, the approaching change announces itself by a gradual diminution in the amount of discharge at successive periods, with the occasional occurrence of an uncommonly profuse flow.

Again, a woman may pass one or two regular periods without any discharge, and then have one of great abundance. In short, all manner of irregularity, both as to amount of discharge and times of recurrence, may be expected. Several months, or even two or three years, may be marked by this variableness before the discharge fails to appear altogether. This is known as the "dodging time."

Women usually regard the approach of the change of life with a good deal of anxiety, and not without reason; for it is well known that certain diseases which may have lain dormant, as it were, in the system are now likely to appear. More or less derangement of health is almost certain to occur. Thus, few women pass through the ordeal without experiencing headaches, frequent flushing of the face, nervous irritation, faintings, digestive disorders, etc. Existing gout, rheumatism, and consumption receive a fresh impulse; while cancer, especially of the womb and breast, is more likely to appear than at any other time of life.

But, on the other hand, many of the chronic diseases of the uterus and ovaries that have heretofore baffled all means of cure, now cease. And it is another hopeful fact that, if dangerous diseases should not be developed at this time, the woman's chances for future good health and longevity are greater than those of the male who has reached the same age. Therefore, while women should not look upon this critical period with indifference, or ignore its possible dangers, neither should they entertain an exaggerated notion of its perilous character. They should know what evils may occur, and, at the same time, they should know how to prepare for and meet them.

The change of life is especially dangerous to those whose health has already been impaired by previous and present disease ; and yet, with the single exception of cancer, the careful and persistent attention to the hygienic rules specified in the next section will usually be sufficient to carry a woman safely through, and prevent the more common diseases of the period.

It is a great mistake to suppose that all the symptoms of disordered health occurring in women forty to fifty years of age are attributable to the change of life, and that hence they should not receive any special attention or treatment. And yet this error is constantly being committed both by physicians and patients. Thus, dropsy depending upon serious disease of the heart, liver, or kidneys ; dangerous floodings produced by the presence of uterine polypus, ulceration, or cancer ; these and similar grave conditions have been referred, without local examination, to the change of life, and treatment, which possibly might have been effectual, if timely used, has been utterly withheld until too late ! If symptoms such as the foregoing, or any others indicative of impaired health, should occur at this time of life, they require and should receive just as prompt and skilful treatment as though they appeared at any other time.

FEMALE HYGIENE.

It is quite as much the province of medical science to prevent disease as to cure it. If this fact were as fully realized by the public as it is by the medical profession, disease would be far less prevalent, and the efforts of physicians to prevent bodily suffering would be more heartily seconded than they now are, both by their patients and by legislators. Medical men may advise those with whom they come in contact how to avoid disease, but, as a rule, the advice is not acted upon. Persons who are in good health will not take any trouble to remain so ; and, similarly, many who are sick are unwilling to incur any inconvenience in order to be cured. They are willing to continue in health and to be cured of disease so long as no effort on their part is required, but on no other terms. Now, the rules of hygiene contemplate, in regard to matters of health, self-help, and self-work ; and the directions which are given in this chapter are for the purpose of aiding those who place a sufficiently high value upon their health to be willing to do something themselves in order to preserve it.

It is believed that at least two-thirds of the diseases of the reproductive organs of women are preventable complaints ; but in order that they may be prevented it is necessary not only that wo-

men should have a knowledge of the laws of health as pertaining to their sex, but that those laws should be obeyed. And so surely does the penalty follow any habitual infraction of those laws that it may be safely predicted that young women who neglect regular and sufficient exercise, who expose themselves to wet, fatigue, and excitement during the menstrual flow, or who recklessly interfere with the function in any way, will, sooner or later, have uterine disease. So, too, in the case of married women may a similar result be looked for among those who, by any means, induce miscarriages, or who are careless after their occurrence, who do not allow the generative organs sufficient time for physiological rest after pregnancy and parturition, or, in short, who in any manner abuse their sexual powers and privileges.

When puberty appears at the proper time and pursues its usual course the condition needs but little, if any, treatment. Nevertheless, when the headache, backache, flushings of the face, and other symptoms indicative of the attempt of the system to establish the monthly flow, are observed to be present, the girl should be relieved from her ordinary duties and permitted to rest on the bed or sofa two or three hours during the middle of the day. The diet should be simple and reduced in quantity. A warm hip-bath is frequently useful and is sometimes sufficient to determine the discharge. No stimulating drinks or "forcing" medicines should be given unless by the advice of a physician.

Puberty may be premature; that is, it may occur at a much earlier age than usual. While we should not regard all the instances of bloody discharge from the genitals of children as menstruation—since such may take place from a great variety of causes wholly unconnected with that function—yet this latter has been known to appear and become regular in girls eight and nine years of age. Sometimes the general health is not affected in these cases, but in others the premature drain has been the cause of debility, dropsy, consumption, and other diseases of a wasting and fatal character.

Under these circumstances, the patient should reside in the country and lead a quiet life; she should have regular, moderate out-door exercise; she should have a cold bath of short duration—say two to three minutes—every second day, followed by brisk friction of the skin; she should avoid anything calculated to arouse the passions, such as going into gay company, reading exciting works of fiction, etc. The effects of loss of blood should be combated by nutritious food and the use of tonic medicines.

The opposite condition, namely, that in which menstruation is tardy in its occurrence, is much more frequent. It not uncommonly

happens that girls reach their seventeenth and eighteenth year without the appearance of the menstrual flow. This results from a great number of causes, both of a local and constitutional character.

The non-occurrence of menstruation at the usual time frequently gives rise to much anxiety on the part of the girl's friends —especially of the mother, who is quite likely to use various domestic remedies of a stimulating sort for the purpose of inducing the flow. This course results from ignorance of the fact that something more than mere age is necessary for the performance of the menstrual function. Let it be understood that *menstruation is the result of the maturity of the organs engaged in its production,* and it will then be apparent that it is useless to attempt by powerful medicines to hasten its occurrence. Indeed, not only will such means certainly fail to produce the desired result, but they are very likely to be productive of evil consequences. When the marks of puberty are absent and menstruation does not appear, no means for coercing nature should be used, no matter what the age of the patient may be. If the latter be in general feeble health and lacking in physical development, such means should be employed as will give bodily vigor, and enable her, through the growth and maturity of her sexual organs, to perform the physiological offices of her sex. The diet should be of the most nutritious character ; she should spend a large part of her time in the open air, preferably in the country, and, if possible, at the sea-side. She should have few in-door employments, and none of a confining nature. Flannel should be worn constantly next the skin, and exposure to dampness and chilliness carefully guarded against. Finally, she should use such gymnastic exercises as may be suitable for her strength.

It is a lamentable fact that, after menstruation has been established, most women, especially those who are in good health, give no attention to the menstrual periods, in so far as these latter may interfere with either their duties or their pleasures. They attend social gatherings, take long walks, ride on horseback, toil at the sewing machine, or perform other laborious duties, just as though the discharge were not present. This is most unfortunate ; and, in many cases, deplorable consequences follow these imprudent practices. Women should know that, although menstruation is a natural process, in our state of civilization, where so many baneful influences are constantly in operation to impair health, the function is extremely liable to become disordered, sometimes from apparently slight causes. For several days prior to its appearance and during the time of its presence, the ovaries, uterus, and the

adjacent organs are in a state of intense congestion; and this congestion needs for its relief the normal periodical discharge of blood. In order that the latter should proceed naturally, it is essential that the woman should have rest—rest for the body and for the engorged parts. Therefore it is that fatiguing walks, shopping, riding, dancing, theatres, etc., should be interdicted during the period; for these things, by their stimulating effect, are likely to disturb and increase the flow, sometimes to a dangerous degree, and induce disease. Equally important is it that, at this time, women should avoid getting wet, sitting in currents of air, drinking large quantities of ice-water, putting on damp clothing, or bathing in cold water. These things are likely to suppress the flow and produce congestive and inflammatory diseases of the uterus and ovaries.

It has been well suggested as a good practical rule that, in regard to exercise and labor, women *should do less than usual* during the menstrual period; just how much less they ought to do must depend upon the conditions attending each individual case.

When the change of life approaches, the sexual organs should have physiological rest. Intercourse should be abstained from or indulged in sparingly. For this reason marriages should not be contracted at this time. The utmost attention should be given to the digestive organs, and everything likely to impair their powers should be avoided. A full bath should be taken once a week in water at 92° to 94° Fahr., and continued one hour. If perspiration be profuse, a bath of shorter duration may be taken two or three times a week. In these latter cases flannel should be worn over the chemise, and in winter over the night-dress also, in order to avoid chilliness from change of posture. *Exercise must be taken*, not inordinately, but regularly. No other remedy is equal to this for the cure of the fidgets, hysteria, sleeplessness, and other evidences of disordered nervous action so characteristic of this period. Walking is the best form of exercise where the strength is sufficient to permit it. Carriage-riding, with other passive exercise, will answer for those who are more feeble; but horse-back riding must be prohibited until the "dodging time" is fairly passed.

Balls, operas, and similar amusements should be likewise suspended. The plethoric should not indulge themselves with too much sleep, but those who are thin and nervous may take as much sleep as they can get. For this latter class sleep is the very best nerve-restorer attainable.

SYMPTOMS OF PELVIC DISEASES IN WOMEN.

The presence of disease in any part of the human body is known by certain manifestations which are termed *symptoms*. These are divided into two classes; the first comprising those which are evident to the patient's own perceptions, as pain, the appearances of discharges, etc. These are called *subjective* symptoms. The second class consists of those which are only ascertainable by the investigation of another person, as the size, shape, color, and other conditions of organs beyond the view and reach of the patient; these are known as *objective* symptoms. It is the first of these classes only that will engage our attention here.

Our principal objects in detailing these subjective symptoms indicative of pelvic disease in women are: 1. To call attention to the important fact that they are *never* sufficient to enable either patient or the physician to determine their real source. 2. To show that, in order to do this, a physical exploration of the pelvic organs is absolutely necessary; and, 3. To explain why it is that, unless the symptoms are thus traced to their origin, all treatment must of necessity be vague, unsatisfactory, and ineffectual.

These statements are made thus emphatically because there are many females who, having a natural repugnance to such physical examination of the genital organs being made, are apt to urge its omission. They think, or seem to think, that it can, and hence ought to be, dispensed with. This notion is an erroneous one, and the physician who undertakes the treatment of pelvic diseases in women without previously satisfying himself, so far as possible, of the nature and extent of the disease, is derelict in his duty both to his patient and himself. Far oftener than is supposed, the nervous and sick headaches of women, their backaches and indigestions, their troubles of bladder and rectum—treated as such for years possibly—are dependent upon some undiscovered uterine or ovarian disease or displacement—undiscovered because unlooked for.

Menstrual Derangements.

Derangements of the menstrual function are frequent accompaniments of disease of the uterus and ovaries. As stated in a previous chapter, the flow may not appear at the usual age. After its establishment the discharge may be scanty, it may be profuse, or it may be attended with pain. Any of these unnatural conditions ought to be regarded with anxiety by the patient, for they

are dependent upon some disorder either of a general or local character. As we shall see when we come to their separate consideration, while they may depend upon certain constitutional conditions, more frequently some local disease will be found to be an important if not the sole factor of causation. Hence, in most cases, a physical examination of the pelvic organs should always precede treatment.

So important are these menstrual irregularities, and so certainly indicative of organic disease—sometimes of very serious character—that no woman should permit them to continue without having the advice of an intelligent physician. Generally this course is not taken until after much loss of precious time and the failure of remedies prescribed by non-professional friends. Thus, many diseases which would yield readily to judicious treatment used in their early stages, become chronic and incurable by neglect, and the patient is doomed to years, possibly a lifetime, of misery.

Leucorrhœa.

[*Leucorrhœa*, or *Whites*, is a discharge from the genitals of fluid, sometimes thin and watery in character, at others containing a thick, sticky mucus from the neck of the uterus, or pus and blood from the uterine cavity. It may be so small in amount as to give little inconvenience, or be so profuse as to require almost constant attention. It may be without odor, or, on the other hand, its odor may be intensely disagreeable, according to the nature of its cause.]

Of all the symptoms indicative of disease of the genital organs in women, this is the most frequent; and it is, perhaps, the most common ailment among them for which the physician is consulted. It is very rarely, if ever, a disease of itself. Nearly always it is merely a symptom of some disease of the pelvic organs. This is a highly important fact, and one which shows the necessity of investigating its antecedent causes before any means can be rationally adopted for its cure. What these causes specially are will be fully pointed out in a subsequent chapter devoted to this subject. [see also, page 554.]

Pain.

The *pain* which is experienced by women suffering from uterine and ovarian disease is of two kinds—that which is connected with the menstrual flow, and that which is felt at other times and unconnected with the menstrual function. The first of these will be more appropriately considered under the head of painful menstruation; the second only will engage our attention here.

The various pains that occur independently of menstruation vary in their degree, character, and location. They are not always felt in the particular organ which is the seat of disease. Frequently they attack parts of the body quite distant; that is, they are "reflected." A familiar example of this reflected pain is that which is felt at the top of the head, as a result of tipping or bending of the uterus forward.

Pain in the back is an extremely common symptom. Usually it is not acute, but rather of a heavy, aching character.

Backache is not necessarily indicative of disease of the generative organs; but the connection between the two, when the symptom has been of long standing, is so frequent, that its presence furnishes strong presumptive evidence of disease of those parts, especially when the pain is habitually more severe just prior to or during the menstrual period.

Pains in the lower portion of the abdomen are likewise very frequent. They may depend upon retention of menstrual blood or the products of conception within the uterine cavity, uterine tumors, displacements or abscess, distention of the bladder, disease of uterus or ovary, etc.

Bearing-down pains are usually found in women who have suffered long from disease of the uterus, and in whom the general health has become impaired. Generally, in these cases the uterus is more or less completely prolapsed (situated lower down in the pelvis than is natural); although uterine tumors, polypi, etc., produce the same kind of pain.

Sometimes pelvic pains are clearly of a nervous or hysterical nature—very severe, possibly, but not connected with any perceptible structural disease.

Pains in the lower extremities are usually caused by pressure upon the nerves from enlargement of the abdominal or pelvic organs, as uterine or ovarian tumors.

Itching of the Genitals.

This sensation is closely allied to pain, and frequently is much more intolerable. The cause is not always readily ascertainable; but very often it will be found to depend upon some local changes requiring actual inspection for their detection. Sometimes it is produced by an irritating uterine or vaginal leucorrhœa, and it is a very frequent accompaniment of the acrid, watery discharge present in cancer of the parts. Occasionally, however, the itching is very severe, extending even into the vagina, without any discharge. Frequently it is associated with

diabetes (or urine containing sugar). Various skin diseases affecting the external parts produce it. It is most common at the change of life, although young women are not exempt from it. It is usually aggravated at the menstrual period.

Treatment.—As we shall not recur to this subject, a few words in regard to the treatment of this distressing malady may not be amiss.

A symptom depending upon so many different conditions clearly requires for its cure the removal of the existing cause; and this, as already stated, necessitates an examination of the parts. Much, however, may be done in the way of palliation.

Strict cleanliness is all-important, and in some cases great relief is obtained by simply bathing the parts in tepid water two or three times a day. Lotions of powdered borax in water (a drachm to a pint), or of the sulphite of soda, in the same proportions, are extremely soothing and sometimes curative. So, likewise, is the frequent bathing of the parts with an infusion of poppy-heads, to which may be added sugar of lead (a half-teaspoonful to a pint).

Where the parts are subject to rubbing or chafing against each other, strips of lint smeared with an ointment of lard and borax, bismuth or oxide of zinc, should be placed between them.

Scratching the affected parts should be avoided as much as possible, as this always aggravates the itching, and produces redness, heat, and swelling. The itching is also increased by acidity of the stomach, constipation, standing near a fire, warm bed-clothing, etc.

Painful, Difficult, and Frequent Urination.

Pain of a burning or scalding character during micturition (the act of urinating) is frequently complained of by women suffering from disease of pelvic organs. It may depend on an unnatural state of the urine, as from undue acidity or alkalinity, the presence of gravel or blood, disease of the bladder, Bright's disease of the kidneys, etc.

Again, it may be produced by inflammation or tumors of the urethra, or its outlet, and also by excoriation of the vulva and inner side of the thighs. Displacements and tumors of the uterus may cause both pain and difficulty in urination, either by pressure against the bladder and urethra, or by drawing the latter from its natural position.

A frequent inclination to urinate is occasioned by almost any of the diseases and displacements of the uterus, vagina, and adjacent parts. To particularize, we may mention ovarian and other pelvic tumors, cancer, polypus and enlargement of the womb;

stone in the bladder, and inflammation or cancer of that organ; diseases of the rectum, as fissure, piles, fistula, etc.

Treatment.—These symptoms, which are referable to the bladder, cannot be treated understandingly without the aid of a physician. The application of warmth externally, and the use of opium or hyoscyamus in some form internally,* may be used as palliative measures. These, with rest in the horizontal position, are frequently sufficient to give temporary relief; but patients who suffer from the distressing symptoms named should always avail themselves of the earliest opportunity for obtaining competent advice.

Amenorrhœa.

The term *amenorrhœa*, although literally signifying absent menstruation, is likewise used to include cases in which the flow is defective or scanty. There are two forms of the disorder, namely: 1. That in which the discharge has never appeared; and, 2. That in which, having been established for some time, it has become suspended or suppressed.

1.—*The discharge has never appeared.*—The menstrual discharge may not appear because of,

a.—General debility and lack of development.

b.—Congenital absence or imperfect development of the generative organs.

When the flow fails to appear in consequence of lack of growth and strength, the figure of the girl, instead of becoming full and rounded as it should at the age of puberty, remains delicate and angular. The breasts are undeveloped, the hips remain narrow, and the chest flat. Instead of becoming a woman, she is still a child. The absence of the menstrual function is but one of the results of sluggish power and constitutional feebleness.

The cases of amenorrhœa which result from absence or imperfect development of the uterus, ovaries, Fallopian tubes, etc., are not frequent; a fortunate circumstance, inasmuch as they are but little amenable to treatment.

Usually, in these cases, there is no deficiency of general development or strength; but, as the age of puberty approaches, the form of the girl, instead of becoming plump and full, assumes a more muscular and masculine appearance. The shoulders are square and angular; the feet and hands are large; the breasts are generally small and imperfectly developed, but not always so. If,

* Fifteen drops of tincture of opium, or double that amount of tincture of hyoscyamus, should be sufficient for one dose.

with these physical peculiarities, there appear none of the symptoms pointing to the establishment of menstruation, we may reasonably suspect some organic defect.

If an examination be made in these cases, the vagina is commonly found to be short and narrow, ending, frequently, in a closed extremity with no trace of a uterus beyond; or, possibly, a mere thickening or cord-like body occupying the place where that organ ought to be. The external organs may be fully developed, although they, too, are sometimes small and defective.

Treatment.—There are all conceivable modifications of this class of cases, some of them admitting of successful treatment; but the propriety of remedial measures can only be determined by a skilful physician.

In the second class of cases active treatment is not demanded, and would be improper. Pure air, plain, nutritious food, regular hours for meals and sleep, exercise, attention to the action of the bowels and skin, will, in time, produce the improvement in growth and vigor necessary to the establishment of the flow.

2.—*The discharge is suppressed.*—After the menstrual flow has been fully established it may cease to appear. There are many causes capable of producing this result—exposure to cold and dampness during a menstrual period, attacks of fever or other acute diseases, violent mental emotion, as excessive anger, joy, fear, etc.

The cessation of the flow happening suddenly during a period, is at once followed by severe pain in the back and pelvis, extending, occasionally, to the abdomen; the pulse becomes full and hard, the temples throb, there is headache, flushing of the face, and a dry and hot skin. The severity of these symptoms varies in different cases, being most intense in women of full, plethoric habit of body.

Treatment.—This condition should receive prompt attention. The patient should put her feet and legs into hot mustard-water, and keep them in the bath half an hour. She should then be placed in a well-warmed bed, with vessels containing warm water to her feet. At the same time she should take freely of warm drinks with the view of inducing perspiration. Nothing is better for this latter purpose than a dessertspoonful of the syrup, or half a teaspoonful of the essence of ginger taken in a tumblerful of hot lemonade. This may be repeated every hour or two until the desired effect is attained. In the slighter cases these means will commonly succeed in restoring the discharge in a few hours. Should they fail, however, and the symptoms of fever continue, a large poultice of flaxseed meal and mustard should be applied over the lower part of the abdomen: while, at the same time, flannels

wrung out of hot mustard-water may be wrapped about the feet and legs, and mustard-plasters applied to the inside of the thighs. The efficacy of these remedies will be greatly enhanced by the administration of a ten-grain dose of Dover's powder. Should the discharge still fail to appear, a physician should be summoned.

In some cases, from neglect of prompt treatment, or from general debility, the suppression of menstruation becomes chronic, and nature, thwarted in her efforts to restore the secretion in its normal form, seeks an outlet in other directions, and a periodical discharge of blood takes place from other parts of the body. This is called *vicarious menstruation.* Usually, this substitute discharge occurs from the lungs, giving rise to grave fears of consumption; but it has been known to proceed from the bowels, ears, nostrils, gums, breasts, or any ulcerated surface.

Such cases are not suitable for home treatment. The object is to restore the secretion to the uterus, and the means necessary for this purpose should only be used under the advice and supervision of a physician.

C. *The menstrual secretion is retained.*—The menstrual fluid, although properly secreted, may be retained; that is to say, may not appear externally. These cases, although considered here, should not be confounded with *amenorrhœa*, in which, as already defined, there is *no secretion.* Here the usual changes connected with puberty have taken place; the ovaries and uterus have performed their work; the menstrual fluid has been thrown out from the surface of the uterine cavity; but, owing to a closure of some portion of the uterine or vaginal canal, it has no outlet, and is retained above the point of obstruction.

In these unfortunate cases the patient suffers from periodical attacks of pain referred to the back, loins and pelvis; from headache, and general disorder of health. With each returning period the symptoms increase in severity; the pains, at first amounting to little more than discomfort, become very intense and assume a paroxysmal character, owing to the contractile efforts made by the womb to discharge its contents; the patient has a sense of fulness and weight in the pelvis; there is frequent desire to urinate, and, sometimes, a difficulty in passing urine, amounting occasionally to complete retention. The bowels are also emptied with difficulty; the abdomen becomes enlarged and tender. After a time, pain is constant, aggravated, however, at the menstrual periods; the general health fails; the patient is dyspeptic, pallid, and suffers from all manner of nervous derangements.

A most distressing feature of these cases is, that, owing to the absence of the menstrual flow and to the enlargement of the abdo-

men, the patient is likely to suffer from the suspicion of pregnancy, and thus immeasurable mental anguish is added to her bodily pain.

The impediment to the exit of the menstrual fluid may exist at any part of the genital tract below the cavity of the uterus. Where it consists in an imperforate state of the hymen, as it sometimes does, that membrane becomes distended, thinned, and may protrude between the labia, presenting a smooth, reddish or purplish appearance.

Treatment.—The only effective treatment is surgical. The operative procedures necessary for relief may be very simple, or of the most elaborate kind. Nothing but harm can result from the use of means to "bring on the discharge;" for such means not only certainly fail of their object, but they may be productive of great danger.

Therefore, whenever a girl has reached the age of puberty, is well developed, and has periodically the symptoms enumerated as indicative of menstrual obstruction, an investigation by a physician should always precede any but the simplest treatment.

Dysmenorrhœa.

By the term *dysmenorrhœa* is understood painful or difficult menstruation. Most women—even those who regard themselves as being healthy—experience some discomfort at the approach of, or during the monthly flow; but it is only when they suffer actual pain that they consider themselves proper subjects for medical advice or treatment.

Painful menstruation is extremely common, and arises from the most varied causes. Usually, the pain precedes the discharge by a few hours, or one or two days, reaching its height just before the flow appears, and subsiding after the latter has become free. In others, the discharge appears first, and the pain continues throughout the entire period. The pain may be constant or intermittent, sharp or dull, slight or severe. Sometimes it is so excruciating as to compel the patient to keep her bed, and even to scream with agony.

The quantity of the discharge does not necessarily vary from that of health, although it is sometimes scanty, and at others profuse. In some instances, after severe suffering, a quantity of membranous shreds or flakes are expelled, affording relief which may be temporary or permanent. Occasionally a large mass of fibrinous substance representing a cast of the uterine cavity, is thrown out. In still other cases, a severe attack of pain will be

followed by the expulsion of coagulated blood; in these, the discharge is commonly abundant, and the patient is left much debilitated at the end of the attack.

As already stated, painful menstruation is associated with very many conditions of the pelvic organs, which, for our present purpose, it would be useless to enumerate. However, the cases may all be placed in two classes, namely:

1. Those in which there is no impediment to the flow.
2. Those in which there is some impediment.

In the first class are to be placed all the cases which depend upon, or are produced by diseases of the ovary, by a gouty or rheumatic tendency, neuralgia, digestive derangements, etc.

The second class comprises all those in which some mechanical obstruction exists to the free outlet of the discharge. Such obstruction may occur in the cervical canal, at the os uteri, or in any part of the vagina. If the passage be closed entirely, the effused blood will be retained, as explained in the foregoing section; but, if the closure be only partial, the fluid will be expelled with difficulty and pain. Such mechanical cause for the pain may be suspected whenever the *pain precedes the discharge.* In these cases the pain arises from the distention of the uterus and the contractile efforts of that organ to empty itself.

Treatment.—The treatment of painful menstruation is either palliative or radical.

The palliative treatment includes those means which have a tendency to lessen the pain; the radical, has reference to the removal of any existing cause. For the relief of pain the patient may do much; but for the detection and removal of the cause of the disorder—especially when this is of an obstructive character, generally requiring surgical treatment—the services of a physician are indispensable.

Pain is always more severe in persons whose general health has been impaired in any manner. Hence, every care should be taken by the patient to preserve or restore her constitutional vigor by all known hygienic means. She should carefully attend to the functions of the stomach and bowels. Such wholesome and nutritious articles of food should be used as past experience has proved to be easily digested, and a daily movement of the bowels should be secured,—by a daily attempt, aided, if necessary, by warm-water enemata, and an occasional mild laxative dose of medicine. For this latter purpose, a teaspoonful of Rochelle or Epsom salt, or a half-teaspoonful each of rhubarb and calcined magnesia will be suitable. Strict attention should also be given to keeping the body warmly dressed. Flannels should be worn next the skin except

during the summer, when they may be replaced by elastic merino or cotton underclothing.

As the menstrual period approaches, the patient should take a full warm bath of twenty to thirty minutes' duration, and then get into a warm bed, where she should remain during the continuance of the flow. When the pain commences, she should swallow a pill containing a half grain of opium and one grain of the extract of Indian hemp. This may be repeated every three or four hours, so long as necessary. If the opium should for any reason be objectionable, two grains of the extract of conium may be used in its stead. In case the patient has difficulty in swallowing a pill, as many have, the following mixture may be used with equally good effect:

Laudanum.....	One-half ounce.
Tincture of hyoscyamus.....	One ounce.
Hoffman's anodyne	One ounce.
Peppermint-water.....	One ounce and a half.

Of this, a teaspoonful may be taken every two hours until the pain is relieved.

By the use of the foregoing means the pain may be greatly ameliorated, but the benefit is usually only temporary. In order to prevent the recurrence of the symptoms, their underlying cause must be removed. Chronic inflammation, flexion, displacement, a fibrous tumor of the uterus, ovarian disease, etc., cannot be abolished by the most skilful administration of medicines; and, inasmuch as dysmenorrhœa frequently depends upon these and similar conditions, it is evident that mechanical and surgical treatment must often be necessary in order to effect a permanent cure.

Leucorrhœa.

Leucorrhœa is, without doubt, the most frequent of all the symptoms of pelvic disease in women; and, under the names "whites," "female weakness," etc., there are few women who are not familiar with it.

The term leucorrhœa is understood to include all the discharges from the female genital organs that are not of a bloody or membranous character—watery, mucous, purulent, etc. They are white, yellow, greenish, brownish, or colorless. They are sometimes as thin as water, and at others as dense as boiled starch or the curd of milk.

Leucorrhœa is not to be regarded as a disease of itself, but only

as indicative of some disorder, either of the general system or of some of the pelvic organs, with this exception, viz. : during pregnancy, more especially during the latter half of the term, a mucous discharge, sometimes very profuse, is always present, and is thought by many to be an essential accompaniment of that condition. So, likewise, an increase of the normal mucous secretion from the parts takes place both before and after each menstrual period. These examples of white discharge are, therefore, to be regarded as natural, and any attempt to check them would be improper and likely to be followed by injurious results.

It must not be understood from this, however, that pregnant women may not have a leucorrhœal discharge in consequence of disease, and it becomes the duty of the physician always to ascertain, in any given case, whether it be the effect of disease or otherwise, before interfering with it, or ignoring it.

Watery Discharges.—Watery discharges from the vagina in non-pregnant women may depend upon the presence of cancer, either of the womb or vagina. In these cases, it may be quite clear and transparent, but is more commonly mixed with small grayish particles, imparting to it a turbid appearance. Likewise, it is frequently mixed with blood, and then resembles brownish saliva; or, it may alternate with discharges of pure blood. It commonly has a characteristic and highly offensive odor. Sometimes it is very copious, necessitating the use of ten or twelve napkins daily.

Polypus of the uterus is also frequently attended with a watery discharge. Here, it alternates with profuse menstruation, and discharges of blood between the menstrual periods.

Mucous Discharges.—When the discharge is mucous, its appearance will sometimes serve to indicate its source. Thus, when it is curdy and has an acid reaction, as indicated by its power to redden blue litmus-paper, it is from the vagina. If it be viscid, tenacious, resembling soap-suds, and contain masses of curdled mucus, it is from the neck of the womb. When creamy and resembling pus, profuse and constant, it may come from both the neck and body of the womb. The mucous discharges, when dependent upon disease, are generally associated with inflammation of the uterus and vagina, and with displacements of the former.

Discharges of Pus.—Purulent discharges from the genital canal may be from the inflamed mucous membrane of the vagina, the glands of the neck of the womb, an ulcerated surface, or the result of gonorrhœa. They may likewise proceed from an abscess external to the uterus and vagina, opening into either of these organs.

Bloody Discharges.—Discharges of a reddish color from admixture with blood may proceed from ulceration, morbid growths

within the uterus, as tumor, polypus, a fungoid condition of the lining membrane, cancer, etc.

Offensive Discharges.—As heretofore stated, leucorrhœal discharges are sometimes offensive in odor. When they are so, women are very likely to fear the presence of cancer. While it is true that a watery discharge, tinged with blood, and having a fetid odor, are sufficient to arouse the suspicion that malignant disease is present, they may all exist as results of other less dreaded maladies. On the other hand, cancer may not be accompanied by offensive discharge at all.

Retained products of conception, as a fœtus or portions of placenta in a state of decomposition, give rise to a discharge very similar to that ordinarily caused by cancer.

Treatment.—From what has been said, it will be seen that each of the varieties of leucorrhœa may depend upon a great variety of diseased conditions ; and hence, anything in the way of treatment can only be uncertain, unless the exact cause of the discharge be previously ascertained.

Nevertheless, much good may be done in very many cases by the judicious employment of vaginal injections or douches. The best appliance for this purpose is that known as the "Fountain" Syringe (see Index), or some of its modifications ; and the best substances to be used are those of an astringent character. Among these may be mentioned, a solution of powdered alum (a teaspoonful to a half gallon of tepid water) ; a decoction of oak bark (half an ounce to the quart of water); a solution of tannin (a drachm to the quart of water), etc. If the discharge be offensive, carbolic acid or permanganate of potash may be added to either of the foregoing (to the extent of ten grains of the former, or five of the latter to the quart of water), or may be used separately. These means occasionally succeed in curing a vaginal discharge, but they are generally to be regarded rather as palliative than curative.

But, whatever local means may be employed, it will commonly be found necessary to attend, also, to the state of the general health, which is nearly always more or less impaired.

Menorrhagia and Metrorrhagia.

A profuse flow of the menses is known by the term *menorrhagia*, while a discharge of blood from the womb at other than the menstrual period is denoted by the term *metrorrhagia*, or uterine hemorrhage. It is convenient to consider these two conditions together, for the reason that the causes which produce the one almost certainly, sooner or later, produce the other also.

It is not an easy matter to define just what should be considered a profuse menstrual flow, estimated merely by the quantity of discharge ; for some women naturally lose much more than others. Speaking generally, however, it is safe to regard the discharge as excessive when the woman is obliged to use more than two or three napkins daily, and when the period continues more than six or seven days. But, as each woman has a standard of her own in this matter, she may regard the flow as inordinate whenever it is much greater than usual *with her ;* or, when it leaves her in a debilitated state.

There are a great many conditions which produce excessive menstruation. Some of these are of a general and some of a local character. Among the former are the gouty and rheumatic predispositions, scrofula, diseases of the heart, liver, and lungs, plethora, general debility, etc. ; while the local causes include chronic inflammatory diseases of the uterus, uterine tumors and polypi, ulceration, displacement, cancer, etc. It will be seen, therefore, that, like amenorrhœa and dysmenorrhœa, profuse menstruation is not to be regarded as a disease of itself, but that it, likewise, is merely a symptom—the principal one, possibly—of a great many various disorders. Hence, the necessity in every case, of ascertaining exactly what these underlying conditions are ; for, unless they are removable, treatment can only be of temporary benefit.

There are two classes of persons in whom an excessive flow of blood may take place at the menstrual period. The first comprises those of full, plethoric habit of body, who live luxuriously, who habitually use rich, stimulating food, and who are indolent and sedentary. In these cases we find what is known as *active menorrhagia.* At the onset of a period there is fulness of the vessels of the head, indicated by throbbing headache and flushings of the face ; the skin is hot, tongue dry, pulse full and hard. The patient has severe pain in the back, with a sense of heat, fulness, and weight in the pelvis. When the discharge appears it is in gushes of bright, red blood, with occasional clots of large size. The flow is somewhat paroxysmal, abating for a short time, and then returning as violently as before,—any movement of the body or any violent mental emotion being sufficient to cause its renewal. Finally, after continuing in this way for some days, the force of the circulation is lessened, the headache and heat of surface diminish or disappear, and the patient is left weakened but otherwise relieved.

If the periods be not too prolonged, the patient may not feel any evil effects for several months ; but usually each succeeding attack returns with increasing severity—the time of the flow length-

ening, and the intermenstrual period becoming shorter, until at last the system recovers its powers less and less perfectly, and the patient's strength is exhausted.

Treatment.—So long as the health of the patient shows no signs of impairment, the profuse discharge may be regarded as salutary.

It is nature's own method of relieving undue congestion of the pelvic organs and of the system at large; and the only proper treatment consists in the use of such means as are calculated to remove the necessity for the inordinate flow.

The diet should be of the simplest and plainest sort; the bowels should be kept regularly open; moderate but regular daily exercise should be taken, followed by rest for an hour or two on the sofa or bed. During the attack it is indispensable that the patient maintain the recumbent position, and she should lie upon a hard mattress. She should avoid all unnecessary movements of the body, and, so far as possible, all disturbing mental influences. She should be relieved of all household and domestic cares. Visitors should be excluded. Cloths wrung out of cold water, and changed frequently, should be applied about the vulva and lower part of the abdomen. Enemata of cold, or cool water, may also be thrown into the rectum.

In case these means should not be sufficient to restrain the flow, and immediate danger threatens, the vagina should be plugged with a piece of sponge squeezed out of water and tightly rolled into a ball. This should then be pressed into the vagina, where, expanding with the filling of its interstices, it will effectually check the hemorrhage. In the absence of sponge, pieces of cotton, wool, strips of old muslin cloth, or even a cotton or silk pocket-handkerchief may be employed. Where a physician is not at hand, this may be done by any intelligent nurse, or even by the patient herself. The vaginal plug should not be permitted to remain more than twenty-four hours.

Menorrhagia never continues in the active form just described for a great length of time. The excessive loss of blood soon causes debility; the contractile power of the uterus is lessened, and the blood is poured out from the vessels of its lining membrane unrestrained. The blood itself becomes more watery, and loses, to a great extent, its power of coagulation; the flow is almost constant, any brief intermissions being marked by the presence of profuse leucorrhœa. All the bodily functions are performed sluggishly, and the patient is thoroughly prostrated. This form of the malady is termed *passive menorrhagia.*

Treatment.—The patient should be surrounded, if possible, by

everything fitted to improve the general health. Her residence should be in a dry, bracing climate ; her food should be plain and digestible, but of the most nourishing kind, consisting of beef, mutton, poultry, eggs, milk, etc., taken at regular times, and only in such quantities as the stomach can easily bear. It is frequently difficult to carry out these dietetic directions, owing to the great feebleness of the patient's digestive organs. Exercise should be moderate, always stopping short of fatigue, and followed by a period of rest.

The treatment during the attack should be prompt and energetic. It must be borne in mind that in this class of cases the uterus is relaxed, flabby, and lacking in contractile power ; and that the object of first importance is to incite it to contraction. This is the aim of all treatment, and unless it can be accomplished the case is hopeless.

The patient should be kept perfectly still in bed, and should not be permitted to leave the recumbent position for any purpose whatever. Cloths wrung out of ice-water should be flapped upon the lower part of the abdomen, and, after remaining a few minutes, should be removed, and the part made dry by a warm napkin. The cold may then be applied as before, again to be followed by the drying and warming of the skin. The sudden injection of ice-water into the vagina or rectum may be resorted to when the external applications fail.

Cold applications in these cases are frequently mischievous rather than beneficial, because their mode of operation is not understood, and they are hence used improperly. Cold is a powerful excitant of uterine contraction, when used in a sudden and temporary manner ; but when it is applied continuously it soon loses its tonic power and becomes very depressing.

Ergot is of great value in these cases. If obtainable, it should be given in doses of a half teaspoonful of the freshly-ground drug, mixed with water or table-syrup, every three hours ; or the fluid extract may be given in the same dose. If ergot be not at hand, or if the stomach should not retain it, gallic acid or tannin may be given in teaspoonful doses mixed with syrup. A strong infusion of cinnamon is also useful, although not so powerful as the other articles mentioned. If these remedies prove insufficient, the vagina should be plugged without further delay, in the manner already described.

When contraction of the uterus has been effected by the foregoing means, it should be maintained, if possible, until the danger is past. For this purpose, firm pressure should be made over the enfeebled organ by placing a pad, made of a firmly-folded napkin,

above the pubic bone, and keeping it in position by means of a bandage pinned tightly around the body.

The local causes of menorrhagia—when such exist—if not removed, soon produce hemorrhage from the uterus at times remote from the menstrual period and unconnected with it. This is called *metrorrhagia.*

The treatment of these cases does not differ in any essential from that suitable for menorrhagia. In both classes of cases it is plain that, while the means mentioned may serve to moderate the flow during the attack, they can do no more than this; and that, to prevent a recurrence, any existing local cause must be removed. Hence the necessity, in every case of persistent profuse bloody discharge from the uterus, of a thorough examination of the parts by a competent physician.

Displacements of the Uterus.

The womb is liable to be displaced from its natural position in a variety of directions. It may be pushed or drawn upward; it may descend; its top may incline backward, forward, or laterally; it may be bent upon itself in any of these directions; and, finally, it may be inverted, or, literally, turned "inside out."

Naturally, the womb has a considerable degree of mobility, and its upper portion may be pushed forward or backward by the varying conditions of fulness or emptiness of the bladder and rectum. These temporary changes of position are not, however, what is meant by the term displacement. By it we understand a decided and comparatively permanent alteration of position.

Prolapsus.—This term is used to denote that condition of the uterus in which it descends from its normal position in the pelvis. It is of very frequent occurrence, and is familiarly known as "falling of the womb." It is most common among women who have borne children, although the unmarried are occasionally subject to it. It varies in degree from the slightest appreciable depression in the vagina to the complete protrusion of the organ from the vulva.

The causes of the disorder comprise all the influences capable of increasing the weight of the uterus, weakening its natural supports, or forcing or dragging it downward.

The symptoms produced by it are usually proportionate in their severity to the degree of the displacement, but not always,—some women suffering more from a very slight degree of prolapse than others do with the womb dangling outside of the body. Women afflicted with falling of the womb suffer from a sense of weight

and dragging in the pelvis and back, tenderness in the groins and bladder, occasional swelling of the abdomen, an uncontrollable desire to strain unavailingly when emptying the bladder and rectum, pain extending from the groin to the lower limbs, leucorrhœa, etc. Together with these direct evidences of the displacement, there will usually be others of a sympathetic character, as languor, depression of spirits, sleeplessness and other nervous symptoms, pain in the side and back, dry cough, and derangement of stomach and bowels.

In almost all the slighter grades of prolapsus, the uterus resumes its natural position so soon as the patient lies down and the weight of the abdominal contents is removed.

Women frequently think "the womb is coming down," when, in reality, the sensation is due to the protrusion, in a greater or less degree, of the vaginal wall, dragging with it either the bladder or rectum. When the uterus itself is the prolapsed organ, it may always be distinguished from other conditions by the presence of the os uteri.

Treatment.—Relief may frequently be obtained in this affection by the judicious use of astringents applied to the interior of the vagina, the walls of which being thus drawn together furnish increased support to the uterus. Injections of alum-water, or a solution of tannin, are among those most commonly used for this purpose. They should always be employed *after* the patient has lain upon the back for some hours, with the feet and hips elevated, for in this position the uterus is able to resume its normal place.

In many cases the use of certain mechanical appliances, termed pessaries, is productive of the greatest comfort and benefit. If well selected and adapted to each particular case, they are sometimes capable of effecting a perfect cure. The proper fitting of a pessary, is, however, a work of skill, and to do it requires a good deal of experience. When it is not skilfully done much injury may result to the patient, and a valuable means of treatment receive undeserved censure.

In some very aggravated cases of complete protrusion of the womb, attended with loss of power in the vaginal walls and enlargement of its outlet, even pessaries are not adequate to retain the organ in position. In such cases various surgical procedures, having for their object the narrowing of the vaginal canal, have been employed, sometimes with gratifying success. These are especially indicated where the prolapsus is due to rupture of the perineum, an accident of frequent occurrence during difficult labors.

Retroversion.—When the fundus of the uterus is turned back-

ward toward the lower portion of the spine, and the os uteri is thrown correspondingly forward and upward toward the pubic bone, the condition is known as *retroversion*. Like prolapsus, it is most commonly found among women who have borne children, or in whom the womb is enlarged from any cause. Hence, chronic inflammation and morbid growths connected with the womb—all of which produce increase of its size and weight—are likely to cause the displacement. Nevertheless, a retroverted womb is sometimes found to be even below the normal size.

The symptoms of retroversion are frequently not referred by the patient to the uterus at all. Pain or difficulty in emptying the bladder and rectum, a dragging sensation in the groins and back, nausea and vomiting, and leucorrhœa, are among the most constant.

Retroversion is generally complicated with inflammation or congestion of the uterus, and it is impossible in most cases to determine whether these conditions are the cause or the effect of the displacement. But, whatever the relation may be of the one to the other, it is necessary in practice to consider both the disease and the malposition, otherwise all efforts to produce permanent relief fail.

Treatment.—Rest, in the recumbent posture, together with injections of warm water, are likely to give relief from the symptoms of pain and pressure; but most cases can only be satisfactorily treated by the replacement of the uterus and its retention in proper position by a suitable pessary.

Anteversion.—This is the opposite of the condition just considered. Here, the fundus falls forward toward the pubic bone, and the os uteri is carried up behind toward the upper part of the sacrum.

The symptoms are such as are common to most of the diseases and displacements of the uterus:—pelvic pains, weight, sense of fulness, frequent micturition, etc.—and hence not at all distinctive. The displacement can only be determined by a vaginal examination.

Treatment.—This consists in removing all weight and pressure from above. The clothing should be worn loosely and supported from the shoulders; the bowels should be kept in regular action by the use, if necessary, of mild laxative medicines. Rest on the back several hours in the day is beneficial, but should not be carried to the extent of impairing the general health. The congestion of the uterus, which is usually present, is best relieved by scarification of the cervix, a measure which can only be undertaken by a physician.

Retroflexion and Anteflexion.—These terms signify, respectively, the bending backward and forward of the uterus upon itself; that is, the fundus only is displaced. These flexions differ from the versions of the womb in the fact that they imply, necessarily, some structural change in the organ. The same causes which might produce a retroversion or anteversion of a womb, with strong, healthy walls, would cause the organ to bend backward or forward if its walls were thinned or weakened,—the flexion being, of course, toward the weakest side.

The symptoms are the same as are present in the versions of the womb—but with this addition, namely, that a flexion of the uterus, by narrowing the calibre of its canal, almost invariably causes pain during menstruation, and sterility.

Treatment.—The treatment must usually be surgical. Certain forms of pessaries are capable, in some cases, of propping up the drooping fundus, and, acting as levers, of straightening the organ. But more commonly, when the fundus is thus raised in one direction, the os uteri follows; that is, *the bent womb is moved from its position, but remains bent.* Intra-uterine stems of various kinds have been used for the purpose of correcting the deformity, and in many instances they have been successful. Their use requires great care, however, otherwise they may be productive of evil consequences.

Other surgical means of cure, as dilatation, incisions, etc., have been employed, all having for their object the straightening of the organ and the enlarging of its canal.

Polypus of the Womb.

A polypus of the womb is an outgrowth of some portion of the uterine tissue, attached to the organs by means of a stalk or pedicle.

Uterine polypi may occur at any time of life, from youth to advanced age. They may be solitary, or several may exist in the same uterus at the same time. Their size varies from that of a pea to a large cocoanut. In structure they vary according to the portion of the uterine tissue which produces them; that is, they may be glandular, mucous, or fibrous.

The symptoms are chiefly leucorrhœa, profuse periodical bleeding, and expulsive pain, aggravated at the menstrual period. These symptoms—especially the hemorrhage—bear no proportion to the size of the polypus, being sometimes greatest in connection with a growth quite insignificant in size.

As a polypus increases in size, it has a tendency to pass out of

the uterus into the vagina; and when it has done so it may be felt by the finger—being no larger perhaps than a filbert, or possibly sufficiently large to fill the vagina. In these cases the pedicle may be traced into or through the os uteri. The polypus is smooth, roundish, and insensible to pressure. If of large size, it may be confounded with prolapsus or inversion of the womb. But it may be distinguished from these conditions by remembering that, in prolapsus, the mouth of the womb may be felt at the lowest part of the mass, while in polypus, if felt at all, it is above, surrounding the pedicle, and that the inverted womb is sensitive to the pricking of a sharp instrument, while a polypus is not.

When the polypus is still within the uterine cavity, its discovery and removal are much more difficult than when it has escaped into the vagina. If the mouth of the womb is sufficiently open, and the polypus descends low enough, as happens sometimes during a menstrual period, it may be felt by the finger introduced into the cervix; but when this is not the case the os uteri must be dilated by artificial means,—preferably by the introduction of compressed sponge—and then the exploration can be made with great facility by passing a finger into the uterine cavity. And this should always be done when the cause of uterine pain, hemorrhage, and leucorrhœa cannot be otherwise clearly ascertained.

Treatment.—When the presence of a polypus has been discovered, the proper treatment consists in its removal. This, of course, is an operation quite beyond the domain of domestic practice, and need not here be described.

Fibrous Tumors of the Womb.

A fibrous tumor of the womb—called also uterine fibroid, fibroma, etc.—appears to be a local enlargement affecting some portion of the uterine wall, consisting of the proper tissue of the organ, and surrounded usually by an enveloping capsule of condensed cellular substance or connective tissue. These tumors occur during the period of greatest uterine activity,—that is, between the ages of fifteen and forty-five years. They vary in size, from the merest granule to enormous masses, weighing sixty pounds and upward. They occupy different portions of the uterine walls; sometimes projecting externally, covered only by the peritoneum; at others being immediately beneath the mucous membrane lining the interior of the uterus; and, lastly, being imbedded deeply in the substance of the uterus. They may exist singly, or there may be several growing in different parts of the uterus at the same time. Fibrous tumors of the womb are of very frequent occurrence;

sometimes exist for years, and attain considerable size without their presence being suspected.

Occasionally cysts or sacs containing fluid form in the substance of the tumor, usually when the latter has attained considerable size; and to this form of the disease the term *fibro-cystic* has been applied.

Symptoms.—The early symptoms are very obscure. The patient, after suffering for some time from feelings of fulness and pressure in the pelvis, observes an enlargement or hard growth at the lower portion of the abdomen, movable, and more or less tender when pressed upon. The surface may be smooth or nodulated. The usual effect of fibrous tumors on menstruation is to increase the quantity of the flow; but this result is not invariable, and sometimes the amount is diminished. Another effect — and one which is constant—is to stimulate the uterus to increased growth, so that where a tumor, even of small size, is found, the uterus is elongated and enlarged.

When the tumor has attained sufficient size, the patient suffers from pressure against the bladder and rectum, and, in addition to the distress attending the action of those organs, she is annoyed frequently with cramps, numbness, and swelling of the lower extremities. When, as sometimes occurs, the tumor becomes too large to be accommodated in the pelvis, it rises into the abdomen and becomes prominent at the lowest part of the latter, and the symptoms of pressure to which the patient has been subjected are suddenly relieved.

Treatment.—Many remedies have at different times come into vogue for the cure — that is, the removal — of these growths, and some of them with reputed success; but it is now believed that they were powerless to produce any such result. Within a few years, however, a number of cases have been published in which a very great diminution in size, and, in some instances, the total disappearance of large fibroid tumors have occurred under the use of ergot administered by injection beneath the skin. Even when this desirable result was not attained, there was very generally a marked decrease in the amount of uterine hemorrhage, where this had been profuse, a lessening of pain, and an improvement of the general health. This mode of treatment should always be tried previous to the adoption of dangerous surgical measures.

Sometimes relief may be obtained by elevating the uterus and propping it up by means of a pessary, and, when the tumor has ascended above the pelvic brim, it may be supported by an abdominal belt, and the symptoms dependent upon pressure thus greatly mitigated.

Under certain circumstances uterine fibroids may be removed surgically; and, when other means have failed to relieve, and their removal can be effected without too great danger to life, such operations are justifiable.

Ulceration of the Womb.

By the term "ulceration," as applied to the womb, is properly understood a loss of some portion of the uterine tissue, especially of that portion of the organ which projects into the vagina. Judging from the frequency with which the term is used, it would be reasonable to suppose that it was a disease of very common occurrence. Such, however, is not the case; on the contrary, it is extremely rare. True ulceration of the womb is nearly always the result of either cancer or syphilis. Nevertheless, the conditions to which the name ulceration is commonly, though improperly, given, are quite frequent; and "ulcers on the womb" afford a lucrative field of practice for a host of illiterate and dishonest medical pretenders. These so-called ulcerations belong chiefly to three classes or conditions, namely:

1. *An Erosion or Abrasion of the Thin Delicate Covering of the Mucous Membrane around the Mouth of the Uterus.*—This exposes the minute loops of blood-vessels, and they present a red and somewhat granular appearance. This state of the parts usually results from, and is accompanied by chronic inflammation of the mucous lining of the interior of the womb; and it bears a similar relation to the latter disease that a furred tongue does to a disordered stomach. Still, although not true ulceration, it is not without importance. If it be neglected or improperly treated, the erosion may extend into the cervical canal, or it may involve the greater part of the vaginal portion, besides being a frequent cause of leucorrhœa, and occasionally of hemorrhage.

2. *Eversion of the Mucous Lining of the Cervix.*—Where, from any cause, the os uteri is unusually open, the mucous membrane of the cervix becomes relaxed and congested, and protrudes from the os, presenting a red, pouting, wrinkled appearance. To any one not accustomed to the various changes of the parts produced by disease, this condition is extremely apt to be mistaken for ulceration.

3. *Laceration or Rupture of the Neck of the Womb.*—This occurs as a result of child-bearing, and is much more frequent than is commonly supposed. It may be so slight in extent as to merely alter the shape of the os, or it may extend quite up to the vaginal attachment of the uterus. One or both sides may be involved.

The effect of this accident is to permit the rolling away from each other of the anterior and posterior lips of the womb, thus allowing the mucous membrane within to become everted, as before mentioned.

Symptoms.—The sufferings of the patient afflicted with laceration of the cervix are usually in direct proportion to the extent of the injury.

The symptoms of this disorder commonly make their appearance shortly after the lying-in patient begins to walk about. They consist of a sense of weight and dragging about the pelvis and hips, a dull aching pain in the lower part of the spine, especially when the patient assumes the upright position, and leucorrhœa occasionally tinged with blood. In addition to these, there is frequently more or less pain in defecation, followed by a sensation as though the bowels were not entirely emptied. The bladder is also likely to become irritable through sympathy, and the patient is harassed with frequent desire to pass water. Soon the appetite fails, digestion becomes impaired, nutrition is imperfect, headache, sleeplessness and other nervous symptoms supervene, and the patient becomes a wretched invalid.

Treatment.—The abrasion of the os uteri, which constitutes the bulk of the cases of "ulceration," are treated more empirically perhaps than any other disorder of the womb. This results from the fact that the reddened, roughened surface is usually regarded as a disease of itself, whereas it is commonly an effect only of some antecedent condition. Thus, as already mentioned, it is often merely the sign of inflammatory disease of the canal of the uterus; and, when this is the case, applications to the abrasion will be, if not useless, at least only temporarily beneficial. Again, it appears sometimes to be caused by the constant contact of irritating discharges which have either the uterus or the vagina for their source. Here, an essential part of the treatment consists in the frequent cleansing of the parts, and the protection of the raw surface from the further action of the irritant. But, usually, the treatment consists in exposing the os uteri with a speculum, and touching the eroded surface with lunar caustic—"burning out the ulcer," as it is termed. This process is repeated once, twice, or thrice a week, so long as the victim's money and patience last. Occasionally this sort of treatment is successful; but much more commonly it fails, and the patient is left as miserable as before.

In every case of this kind, the digestive organs should, if deranged, be restored to healthy action. Sufficient rest in the horizontal position should be enjoined to relieve the attendant congestion of the uterus. Vaginal injections should be used suffi-

ciently often to keep the parts cleansed from leucorrhœal discharge. The uterus, if prolapsed or retroverted, should be supported in its normal position by a suitable pessary, which must not touch the diseased spot. Alterative applications of various sorts should be employed at intervals of five or six days. If inflammation of the cervical canal exist, this should be treated; and, if any other condition of disease, displacement, or anything calculated to produce or maintain uterine congestion, be present, it should be removed. Treatment based upon these principles will be found adequate to deal with all the usual forms of so-called "ulceration;" but the particular means mentioned will be quite inefficient when applied to cases of eversion of the cervical mucous membrane, or laceration of the neck of the womb. For both of these conditions surgical treatment is indispensable. The operative procedures necessary for their cure are not at all dangerous, and should always be submitted to by patients who are so unfortunate as to need them.

Ovarian Tumors.

The subject of *ovarian tumors* is too extensive to make it possible to do more than merely allude to their more important features. They are divided into two classes: the solid and cystic. The former are quite rare, while the latter are very frequent. The cystic tumors are the only ones which we will consider.

Cystic disease of the ovary, also known as ovarian dropsy, consists essentially in a degeneration of the ovarian tissue, and the formation within it of one or more cysts or sacs containing fluid. The tumors thus formed vary greatly in size, from that of a grape up to a mass weighing forty, fifty, and even one hundred pounds. They are not confined to any particular time of life, having been found in young children and in women past the climacteric. They occur most frequently, however, between the ages of twenty and forty years.

The symptoms are at first extremely obscure. Commonly, the first indication the patient has of the existence of the disease is the discovery of a swelling at the lower part of the abdomen, generally on one side. Pain, more or less marked, is usually felt in the tumor, or in the parts surrounding it, and there is sometimes difficulty in moving the leg of the affected side. The tumor may increase in size, either slowly or rapidly; usually it is of rapid growth; its surface may be smooth or lobulated. Its growth results from the formation of new cysts, and also from the enlargement of those already existing.

The fluids contained in the cyst vary greatly in their physical

characters, being sometimes thin and transparent as water, and at others thick and gelatinous as boiled starch or tar. In color they are white, yellow, green, brown, and all intermediate shades.

The cysts may be no larger than a pea, or they may contain many pounds of fluid; and their walls may be so thin and delicate as to rupture under the least pressure; or they may be firm and dense, and half an inch or more in thickness.

The general health of patients affected with ovarian tumors does not usually give way until the growth has attained considerable size, although this is not always the case; some seeming to suffer more from the presence of a tumor, the size of a child's head, than others do when it has reached beyond the lower edge of the ribs.

Occasionally there is much difficulty in distinguishing between ovarian tumors and other conditions which produce enlargement of the abdomen, as pregnancy, dropsy, tumors of the uterus, etc., and the highest degree of skill is required to determine between them.

Treatment.—A great many remedies have at different times been employed for the purpose of causing the disappearance of ovarian tumors. *They have all failed.* The troublesome symptoms resulting from distention and pressure may be relieved by tapping the larger cysts and drawing off their contents; but the amelioration is only temporary, and the operation is not unattended with danger. The only radical treatment consists in the removal of the tumor by surgical operation.

Ovariotomy, although a dangerous operation, offers to the patient whose life is threatened by advancing ovarian disease, the only chance of escape. Hence, *so soon as the health begins appreciably to fail, the time for operation has arrived, whatever be the size of the tumor*—provided that there be no other important organic disease present. An operation should not be delayed until the patient's powers are well-nigh exhausted—an error frequently committed both by the patient and the surgeon. Valuable time is lost in testing various remedies recommended by ignorant or interested advisers, including drugs, liniments, plasters, bandages, mesmerism, electricity, and other inefficient means, some of which would not be injurious, but simply useless, if their employment did not involve dangerous delay. In the practice of experienced operators fully two-thirds of the patients who undergo ovariotomy recover; and it is highly probable that even this favorable proportion would be increased if the operation were performed earlier, and not left, as it now too often is, as the last resort.

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Idiocy, and Nervous Diseases of Adult Life.

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IDIOCY.

This term is quite inappropriately applied to a variety of morbid mental disorders which commence in early life, while, strictly speaking, its application should be limited to a condition which is congenital; that is to say, to a more or less undeveloped brain and a corresponding weakness or absence of the mind. Children, for instance, come into the world sometimes with three fingers instead of four, two heads instead of one, or without either arms or legs. When they are born with brains which are structurally deficient in parts or in quality, they are called *idiots*. It is true that there are conditions known as *infantile dementia*, or *imbecility;* but these either follow other forms of disease, or are directly produced by a variety of causes, to be alluded to hereafter.

A weak-minded child may therefore be either an idiot, an imbecile, or may be simply the possessor of what has been called the *insane neurosis;* consequently the shades of mental feebleness vary to a very great extent, and in some cases the child may present peculiarities which cause people to call it "queer," "odd," "silly," or weak-minded; or its absence of intelligence will call forth still more expressive adjectives. An idiot, therefore, comes into the world with its unhappy heritage, while the imbecile or demented is unaffected until the onset of the nervous disease which destroys its brain and mind.

The children with the insane neurosis are not necessarily idiots, but in many instances begin a life of misery with an inheritance of the most unfortunate character. In early life their lot is one of trouble, and in adult life they are quite likely to become insane. These are the children in whom lying, petty thieving, and cunning (which by some thoughtless and unprincipled persons are supposed to be evidence of "smartness") are expressions of an inherited propensity for wrong-doing, and the perceptions of right and wrong are more or less blunted. Such children are highly emotional or irritable. They laugh and cry immoderately

under the most inconsiderable stimuli. They smile or laugh when they should be serious, and are very apt to take unreasonable prejudices. At an exceedingly tender age they are able to perform certain mental feats which seem wonderful. They often display a precociousness which is striking; being able to master poetry, or recite long pieces. It will be found, however, that they are far behind other children of the same age in reasoning and thinking ability, and they are usually devoid of judgment, or comprehension of matter with which they should be reasonably familiar. They are unusually fond of music and rhythmical sounds, and learn to play and sing at an early age. Among such children convulsions, chorea, or St. Vitus' dance, and other nervous troubles are not uncommon. As they grow older there is a manifest disinclination to study or to apply the attention. Among other children there is a high degree of stupidity which is noticeable almost from the time of birth. If this is associated with certain malformations of the head, we have reason to suspect idiocy.

The peculiarities in the shape of the head of the idiot are the following: an unusually small head, flattened anteriorly, so that it has an ape-like shape. Its average circumference is about thirteen inches, while that of the normal head is never less than eighteen or twenty inches. This small development (*microcephalus*) is supposed to be due to premature union of the bones of the skull.

There are other evidences of non-development which are striking and should be taken into account, and the first in importance is the change in the appearance of the teeth, which are irregular both in shape and arrangement, and quite liable to decay. The gums are spongy and bleed readily, and the first set of teeth are shed at an unusually early period. The upper jaw protrudes, and, when the mouth is open, presents the appearance seen in the horse or other animals possessing a prehensile jaw. The lips are usually full and thick, especially the lower, and are clumsily managed, so that saliva trickles from the corners of the mouth. The roof of the mouth will be found to be altered in shape, it being vaulted, quite narrow, and often containing fissures. The tongue is quite long and large, is furrowed, and, like the lips, is under imperfect mental control. The eye-balls, as a rule, are prominent, fishy, and devoid of expression, and such ocular defects as strabismus (the condition known as cross-eye) are common.

Various deformities—which, however, must not be confounded with those of paralysis occurring during early life—are met with. Children possessing these faults of configuration are sometimes unable to walk, but, when held up, scrape their toes over the floor in a spasmodic manner. The skin is usually of a "muddy" color

and very much wrinkled, so that a prematurely aged expression is presented, while the muscles lack power and are poorly nourished. Certain peculiarities of this kind have led students of anthropology to divide idiots into certain ethnological groups, from their appearance, arguing that the idiot is but a type of a degenerate process, and that he bears a more or less close resemblance to some one of the lower great race divisions. There is always, according to Darwin and others, a retrocession toward the original type ; for instance, according to this observer, certain subjects present the Ethiopian type, for though they may be the children of white parents, they have high cheek-bones, puffy lips, crinky black hair, but the skin is not necessarily black. Others resemble the Malays, and have large mouths, prominent upper jaws, black curly hair, etc. In others are contained the elements which make up the Mongolian physiognomy, while a fourth class present the characteristics of the American Indian. Any one familiar with the appearance of idiots in large institutions can hardly help being amazed at the striking resemblances of this kind.

So low is the development of some of these unfortunates, that they are little more than vegetables in their modes of life. They but eat, drink, and sleep ; are confined to their beds, and their habits are of the filthiest description ; they are indeed little more than automata. In other subjects, and in adult idiots, this automatism is seen to perfection. Their childish amusement is of the most primitive kind ; a piece of bright tin and a button or two or piece of string affording perfect contentment. An idiot will sit for hours and days drawing the string through his hands, or arranging his buttons. Many idiots and imbeciles are totally blind, and in some cases deaf-mutism is associated with the other defects.

The existence of a varying amount of intelligence is the rule, although such mental action may be of the lowest order, and hardly to be called forth by the effort of the physician or friends of the idiot. Certain forms of very high intellectual action may be displayed, while in other things the individual is little more than one of the lower animals. A case is related by Dixon, which illustrates this most perfectly:

" A lad, who had not sufficient power of reason to avoid danger, and who was usually listless, though at times mischievous, and always requiring surveillance, could yet calculate correctly any number of figures without the aid of memoranda. He was asked one day by a gentleman, who had made a calculation on paper, the number of days that had elapsed since the creation, calculating the date of the creation as 4000 years before the establishment of the Christian era. The lad almost instantaneously gave answer,

to which his questioner objected. The idiot then asked to see the memorandum, and pointed out that his examiner had omitted to enter the leap-years into his calculation; and this extraordinary intelligence occurred in an individual who would hardly have been able to distinguish between sugar and sand, had they been put into his mouth."

Unusual Forms of Idiocy.

Two peculiar forms of idiocy are mentioned by medical writers. One of these is **Theroid Idiocy,** in which the physiognomy and behavior of the idiot resembles that of some of the lower animals. Children may resemble sheep or monkeys, and in manner and appearance suggest this peculiar degeneration.

Cretinism, in which there is goitre and bodily deformity in addition to the intellectual impairment, is peculiar to some parts of Switzerland, and is supposed to be due to atmospheric or soil influences, which, as yet, are shrouded in mystery.

Imbecility of early origin is a condition dependent upon extensive primary brain disease. It may follow infantile convulsions, softening of the brain, and hydrocephalus (water on the brain). In the latter instance the size of the head is usually greatly increased.

The intellectual condition and the capacity for development vary greatly. Many imbeciles are able to go about by themselves, but are nevertheless occasionally dangerous and homicidal, as they are totally lacking in moral sense. Such individuals are very often suicidal, or are disposed to be mischievous and troublesome. In large institutions they display destructive tendencies, tearing their clothing, breaking windows or furniture, and occasionally setting fire to their bedding. Like idiots, their personal habits are extremely filthy. They eat voraciously, and sometimes choke themselves by stuffing their mouths full of food. They may be taught a great deal, but it is not possible to carry the mental training so far as with the idiot. Basket and mat making, farm work and shoemaking are sometimes learned, while many imbeciles, who were supposed to be unteachable, have become really good musicians.

Both idiots and imbeciles are found in whom the power of speech is lost, or very much limited, although this is more common in idiocy. In such cases the power of communication by speech is limited to but a few words, though it is possible to teach many of them how to speak. A form of such disturbance, which is extremely interesting, is known as *echolalia*. The person, when spoken to, will invariably repeat the last two or three words of the sentence addressed to him. When asked, "How do you do?" he

replies, "—do you do;" or, "Did you have enough to eat to-day?" answers, "—enough to eat to-day." Though asked numerous questions, he always replies in this manner, and does not talk of his own accord in any other way.

The imbecile, as a rule, does not present any of the deformities of the teeth or jaw which are so conspicuous in the idiot. If the configuration of the skull is changed, it is, as I have said, larger than it should be. In a great many examples there are physical deformities which are the result of brain disease. In some cases the limbs are bent and twisted as a consequence of paralysis, and the face is paralyzed in others. Some imbeciles are stunted in growth; though this, by no means, always happens.

Infantile dementia, which is closely allied to imbecility, but in which there is usually a much lower grade of mental power, may follow exposure to the sun, drugging by narcotics, certain forms of wasting disease, and head injuries received in early infancy.

Causes.—The two most important causes of idiocy are marriages among relatives and intemperance. Dr. Howe, of Massachusetts, Downs, of England, and others, have shown that the marriage of first cousins results very frequently in the production of degenerate progeny. At least eighteen per cent. of these children are idiotic, and the proportion is undoubtedly larger when the stock is bad, *i. e.*, when there is nervous disease on both sides, or chronic alcoholism. Insane or weak-minded women are very apt to bring into the world feeble offspring; and this transmission is more commonly from the mother's side than from the father's—that is to say, the union of a weak-minded father and a healthy mother will not be so unfortunate as one of a father with normal mind and a weak-minded mother. Downs' statistics are the following:

"Marriage of cousins: 20 marriages produced 138 children, *i.*, *e.*, 6.9 each. Of the 138 children, 75 had health and intellect; 11 were consumptive; 8 were still-born; 4 died from convulsions or fits; 2 were hydrocephalic; 7 died young from infantile complaints; 6 were puny and delicate; 25 were idiots. Total 138."

The downward tendency which follows a combination of vice and inter-marriage is thus summed up by Morel, and quoted, as follows, by Dixon:

"In the first period—the first generation—there is alcoholism and immorality. In the second, hereditary drunkenness, maniacal outbursts, and general paralysis. In the third, sobriety, homicidal mania, melancholia, confirmed mania, homicidal tendencies. In the fourth, feeble intelligence, stupidity, early mania, idiocy, and, finally, extinction of the stock."

The influence of intemperance in the production of idiocy is

too powerful to be disregarded. Prevost has proved that, in three generations of drunkards, a primarily healthy stock will run out, and that the children of the second generation will be, many of them, idiotic and insane.

It is rare that idiotic or imbecilic parents bring into the world any issue, especially so in regard to idiots. Instances are, however, related, one by Lucas, of a child born of idiotic parents. This "child was left among the cows in the stable, and acquired the habit of ruminating like them." (Bucknill & Tuke.) Esquirol has seen two cases of this kind, and another case is reported in which an idiot married a healthy woman who gave birth to an idiotic child as the fruit of the union.

Treatment.—Idiots are good-tempered, and, as a rule, get along very well together, and the vicious subjects are chiefly imbeciles or idiots in whom epilepsy is a part of the trouble.

Saegert, of Berlin, and Maxwell, of Earlswood Asylum, England, speak of the good results of the association system and the beneficial results of discipline. The latter says: "As to the cases we have in the asylum, I think I may say that they all have improved more or less. Kind treatment, good diet, and attention will improve the most helpless cases. Many that came in dirty, irritable, etc., not only become cleanly, but get to speak intelligently, to dress themselves perfectly, and make themselves useful. Other cases will do a great deal in the school: for instance, we have a case which came in spiteful, obstinate, and unable to read and write. Now he reads well, writes well, also writes from dictation, draws very nicely, can sing several songs, can play on the harmonium, and can drill, which has made him walk upright. He has latterly been in the mat-making shop, and can make the best part of a mat. Another boy has *improved* in all the above, and is learning mat-making. He possesses, perhaps, the most intellect of any of the boys, but I cannot say that I think he will ever be like an ordinary person. The cases most favorable are those between seven and twelve, which are healthy, can speak, and are free from fits and paralysis."

This is the experience of others. In the Idiot Asylum on Randall's Island, New York, there is a well-conducted schoolhouse where cleanly and well-dressed children may be found reciting, singing, and sewing. Many of them were apparently helpless idiots—the children of the streets—who were not only neglected by their drunken parents, but left to die in the gutters. Many may be raised to a condition which will enable them at least to support themselves.

The management and improvement of weak-minded children

must depend greatly upon the form of mental disease. Idiocy may in many instances be treated with some degree of success, and even imbeciles may be taught to do many things which at first seem impossible. These patients are better taken care of, and are more susceptible to good influences, when they are with others afflicted in a like way; for this reason asylum treatment is better than any other. There seems to be a mutual dependence upon each other. It is most injudicious to neglect a child of this kind, to keep him shut up, or to deny medical treatment, simply because he has been pronounced idiotic. It is by far the more wise course to place him in a good institution. If this is not possible, the parent must exercise the greatest patience and forbearance in home education.

The teaching of gymnastic exercises should form a prominent part of the education of weak-minded children. In many idiots there is an inability to perform the simplest acts, and it is possible to teach them to use their arms and legs. Among the apparatus for gymnastics employed at institutions is the ladder, which the child is taught to climb. He is first suspended by his hands, but, by constant encouragement and the semi-involuntary use of the limbs, required to prevent himself from falling, he gradually learns to climb.

Various other light forms of calisthenic exercises are in vogue. One of these, used at the New York State School, consists in hurling a light stick or ball from one to the other. This simple act is well arranged to engage their attention. Amusements which necessitate rhythmical movements are strongly advised, for they call into play and develop an emotional and low grade of intellectual mental action which afterward becomes increased. Light Indian clubs, rings, or dumb-bells, used in company with a number of other children who go through certain exact movements, while time is kept to the piano, are recommended.

A variety of methods of education are suggested. These vary from the simplest course of the Kindergarten school to those of an advanced character. Colored beads may be used in a variety of ways. The children are to be taught how to form patterns and figures with these, to put differently tinted beads alternately upon a string, to arrange colored bits of paper and straw. Size and comparison are taught by "dissected" maps, or, in the beginning, by a board full of different-sized holes, into which the children are taught to thrust plugs, which are also of varying sizes.

In the same way it is possible to teach them the forms of letters and their appearance together in words. Object teaching is of the greatest importance, and articles which they use, or are

surrounded by, should be resorted to; for instance, the weak-minded child is made to understand that its bread is *white* and *soft*. Other substances having the same physical properties are presented to them, and compared by the instructor, but the other points of difference are pointed out by him.

Gentleness and patience, but earnestness of purpose, and systematic treatment, are requisite for the teacher. He should stir up the slowly-working mind, and, as much as possible, supply the will needed by his weak subjects.

It would hardly do to finish this chapter without some hints as to the management of children who are neither idiotic nor imbecile, but merely the possessors of the *insane neurosis*. A child of this kind is a care indeed, for, unlike the idiot, there is enough will, unbalanced emotion, and perverted moral sense to give rise to constant annoyance. Strict discipline without violence and the formation of regular habits are the desiderati which must be accomplished before anything else can be done. The daily life of such a child should be characterized by the greatest regularity and system. He should eat, sleep, study, and play at stated times when it is possible, and nothing should be allowed to interfere with this mode of life.

As to study, it will be found, if there is not a sufficient amount of brain-work and application, that various mental vices will be formed. The study, however, should be of the simplest kind and well arranged and graded. Such a child should not be sent to school until after the seventh or eighth year, and for three or four years or more it should not be permitted to devote its attention to more than three or four elementary branches.

Its diet should be light and nutritious, and fatty foods, easy of digestion, are to be given in moderate quantity. Sleep to the amount of ten or twelve hours should be obtained if possible, and cold bathing and friction should be used in the morning.

Above all, the child should be guarded against influences which might shock its highly sensitive nature. Rough and unthinking companions, and bad tempered or rude playmates, should be kept away from him, and, when the tender period of life which precedes the tenth year has elapsed, he should be sent to some good school where there are not more than a dozen other scholars.

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NERVOUS DISEASES OF ADULT LIFE.

THERE is a strong predisposition to nervous diseases among certain individuals, especially those who are the descendants of persons who have been either insane, epileptic, or paralytic, or who have been the subjects of consumption. The possessors of the "nervous temperament," or nervous diathesis, described in the article upon **Idiocy**, are especially subject to nervous disease, while the phlegmatic individual is more liable to other diseases, as a rule. Nervous disease is to be looked for among those who indulge to an excessive degree in mental labor, or who have contracted bad habits and vices.

The diseases to which I shall allude are more common in the adult, though they may appear in early life.

Cerebral Congestion.

Cerebral congestion, or hyperæmia, is a disease not entirely confined to any age, and is usually dependent upon general disease. As a rule, the patients are adults, and more often men than women. The special symptoms are fulness of the head, flushing of the face, a sensation as if the head were confined in a tight band. The sufferer complains of "roaring," or "noises in the ears," and very often sees bright or dark specks, or motes. There is a sense of pressure behind the eyeballs, and the eyes are red and watery. Headache is a constant symptom, and the patients are troubled with loss of memory, irritability, and general restlessness. They are often low-spirited, and mental action is obscured and slow. Sleep is troubled, and disturbed by dreams. The skin, especially of the face, is puffed and red, and at times the vessels of the temples stand out prominently.

In the course of cerebral congestion, there are sometimes attacks, which may be of three different kinds:

1. *The Congestive Apoplectic Attack.*—The patient, after suffering in the way described above, may suddenly fall to the ground. His face is congested, and he breathes heavily. He becomes unconscious, and so remains for a short time, but regains control over himself in a few minutes. He is confused and dazed after the attack, and speaks with difficulty. There may remain, for a short time, a slight paralysis of one side.

2. *The Maniacal Attack* is characterized by a sudden seizure, during which the individual becomes excited and violent, and for a short time may be entirely insane.

3. *The Epileptiform Attack,* which resembles very much an ordinary epileptic fit, only with its subsidence there is some maniacal excitement.

A form of congestion of the brain, known as *passive hyperæmia,* is connected with an accumulation of venous blood in the vessels of the brain. The patient is heavy and stupid, falls asleep readily, and suffers from unusual torpidity of mind.

The tendency of congestion of the brain is towards severe organic disease, and such a condition is often followed by the rupture of a cerebral blood-vessel, and more or less permanent paralysis. (See **Hemiplegia.**)

Causes.—The disease may result from any cause preventing a return of blood from the head, or a determination thereto. Among these may be mentioned the bad habit of wearing tight neck-gear, the use of stimulants, exposure to the sun, or overwork of any kind. An enlarged heart often exists with congestion of this character, and the coexistence of liver troubles of various kinds is not uncommon, especially in middle-aged people. The stoppage of any natural flux will act as a cause; for this reason, we find cerebral congestion in women who suffer from dysmenorrhœa. Malarial poisoning is responsible for much trouble of this kind.

Treatment.—The removal of the exciting cause is of the first importance, and next to this the patient should be required to lead a quiet life. Stimulants are only good in passive congestion. Cold applications to the head, and the use of mustard foot-baths are useful in acute attacks. The constant use of moderate doses of the bromide of potassium (10 to 15 grains), three times a day upon an empty stomach, in a half-tumblerful of water, does much good, while the bowels should be kept open with saline purgatives, such as Rochelle salt or any of the bitter mineral waters. If the case is at all persistent, no time should be lost in consulting a physician.

Cerebral Anæmia.

When the brain is deprived, to a greater or less extent, of its blood, a condition is produced which has received the above name.

Acute cerebral anæmia is the form which accompanies shock, an ordinary fainting attack, or general loss of blood. The face then becomes pale, the pupils dilated, and there is partial or complete loss of consciousness. The pulse becomes small and thready as the heart's action is markedly interfered with, while the surface of the body is cool, and sometimes clammy. Respiration is usually sighing; and if the shock be sufficient, it is stopped, and death results.

The condition known as *chronic cerebral anæmia*, is, like cerebral congestion, a symptomatic state. Certain losses of blood, such as result from bleeding piles, excessive flooding at the menstrual period, or other drains of the vital fluid, will be followed by improper supply and consequent failure in the nourishment of the brain. As a result, symptoms of headache, usually confined to the top of the head, with pressure, singing in the ears, sleepiness during the day, and insomnia or loss of sleep at night, weakness of vision, pallor, general lassitude and weakness, digestive disorders, constipation and palpitation, are quite common at some time or another. Women suffer more than men, and the trouble is usually aggravated at the menstrual period.

Causes.—Any of the depleting causes already mentioned, as well as disease of the liver, overwork, and insufficient or improper food, will produce the disease, while gout and other constitutional diseases play no important part in its genesis.

Treatment.—Medicines which tend to produce an improvement in the quantity and quality of blood and nerve-tissue, are used. Among these are iron, cod-liver oil, arsenic, and phosphorus, while nourishing, hearty food is to be given. Rare meat, game, poultry, with moderate quantities of red wine or beer, are absolutely necessary. If the patient is sleepless, a glass of lager-beer may be given at night. If there be liver trouble or hemorrhoids, these conditions should be treated. Pills of podophyllum or mandrake are excellent when constipation attends the former, while bleeding piles should be treated by cold bathing of the parts, or by astringent applications, such as tannin. Uterine disorders often need attention which the patient herself cannot very well direct.

Spinal Anæmia, or Spinal Irritation

are conditions expressed by pain at the upper part of the spinal column, which is increased by pressure; a sense of tightness or constriction about the body, feebleness of the limbs, neuralgic pains, weakened digestion, and indisposition to take exercise. To these are added constipation, and often the passage of large quantities of urine of a light color. Females suffer more than males, and there is usually a certain amount of associated hysterical trouble.

Tonic **treatment** such as that suggested above, should be resorted to. Change of air and scene is important, and salt-water bathing is of valuable assistance.

Headache.

Headache is probably one of the most common symptoms of disease. It may appear in the course of nearly all of the fevers, eruptive and otherwise, in diseases of the brain or lungs, in digestive diseases, in disease of the heart or kidneys, or as a simple functional condition. In other parts of this book its symptomatic significance is alluded to where special organic affections are discussed. We will here glance briefly at it in connection with some two or three of the diseases which give it origin.

Sick headache, the most familiar form, and known to most of the readers of this work, is a species of neuralgic disturbance. It is ushered in by faintness, chilliness and pallor, general discomfort, and pain of a paroxysmal character. One side of the head is usually involved, and when the pain becomes severe, the face becomes flushed and anxious. After a variable time, extending from an hour or so to a day, the pain finally becomes associated with nausea, the individual makes attempts to vomit, but does not always do so, and the attack wears itself out. The pain is dull and throbbing, and every beat of the heart causes untold misery. Usually lying down increases the pain, and the patient assumes an upright position for relief.

Disorders of the stomach are connected with this as well as other forms, but in this kind of headache the gastric trouble is a result, not a cause. In the so-called "bilious headache," the pain is diffused over the head, and there is browache of an intense character, and vertigo. For some days before, constipation or indigestion have existed, and the stools are either dry and contain hard balls, or are clay-colored through deficient supply of bile.

Among delicate women there is a form of headache which is

worse on awaking, and seems most intense on top of the head. It is connected with general debility, backache, some uterine trouble as a rule, painful menstruation, etc. In hysterical women, there may be soreness of the scalp so that contact with the pillow is excessively painful. In such cases, there is the feeling of a lump rising in the throat. Malarial headache, which may or may not be periodical, is usually dull, and connected with pain at the back part of the head. It is common among those who have lived for a short time in a malarious district, and with it there may or may not be a history of chills, vague pain in the bones, or gastric disturbances. Constipation will frequently give rise to a headache of severe character, and often it will be found in such cases that there are hemorrhoids or piles.

The use of certain drugs, such as opium, chloral, or alcohol, will cause headache, usually of a congestive nature.

Disease of the kidneys will often be attended by headache of an intense character, and is a dangerous symptom. There is, at some time or other, backache—the pain being just below the ribs, and not in the "small of the back." The urine, when heated, and treated with a few drops of nitric acid, will be found to contain a white cloud of albumen, though this is by no means a certain discovery. The skin has a white, puffy appearance, and pressure of the fingers over the skin leaves a dent in the tissues of the legs. This headache may be the precursor of convulsions.

Organic disease of the brain, such as tumors or softening, is often expressed by pain confined to any part of the brain, but is limited. It may, in some cases, be localized, if the skull or the membranes of the brain are the seat of disease. With tumors, the pain is often paroxysmal, and very intense. Gout and rheumatism very often give rise to headache, and this may be connected with tenderness of the scalp. It is worse at night, and sometimes is dependent upon rheumatic meningitis [inflammation of the membrane covering the brain], which is a serious disease, and should be looked upon with alarm. Last of all, may be mentioned syphilis, which, during its tertiary stage, may give rise to great suffering. Such a headache is worse at night, and very obstinate.

Treatment.—The management of sick-headache is a troublesome matter, that is, so far as the patient himself is concerned. There are two or three excellent remedies, however, which relieve a certain number of cases. If these fail, the patient should consult his physician. Guarana powder, in doses of thirty to sixty grains, in water, given every hour, until five or six doses are taken, is the best of these agents. The muriate of ammonia is also of service in stopping an attack, and twenty grains may be administered

in the same way. The bromide of potassium or sodium, in doses of fifteen or twenty grains, will often break up a light headache. The use of cold applications to the head often does good.

For the morning headache of anæmic people, a cup of coffee or tea, taken on arising, is the best domestic remedy, while some form of iron should be administered regularly, with nourishing food and a moderate quantity of stimulants. When a suspicion of malaria exists, quinine should be resorted to. No time should be lost in consulting a physician, when one can be had, should there be any evidence of kidney trouble; if none is within reach, hot-air baths, with sweating beneath blankets, and free action of the bowels obtained by the use of calomel and compound jalap-powder in twenty-grain doses, are recommended. In organic disease of the brain no domestic treatment will be of avail. In hysterical headache a dose of a teaspoonful of the ammoniated tincture of valerian in water will do much good.

Above all things, the stomach should be rested, and never abused. Errors in diet may lie at the bottom of all the mischief. In nervous subjects this is especially the case, and with them nervous excitement of all kinds is to be guarded against. Emotional excitement, mental overwork, or fatiguing occupations are to be avoided.

Giddiness.

Giddiness or vertigo is always a symptomatic condition, and caused by digestive disturbance, altered conditions of the circulation in the brain, and a variety of other causes, such as malaria, exposure to the sun's rays, hemorrhage, disease of the ear, or organic disease of the brain.

Digestive disorders are most commonly the causes of vertigo, and the patient generally complains of his distress after a hearty meal. There is a sense of great fulness, sometimes eructations of wind, buzzing or other noises in the ears, and dizziness which lasts for a few moments, during which the patient may lose his balance and fall. The person may see bright specks or clouds during the continuance of the giddiness, but they do not occur when the head is lowered. Elderly people suffer more than do those of any other age, and persons fatigued by overwork, intellectual or physical, are quite subject to the disorder. Any stoppage of a natural flux, obstinate constipation, or exercise immediately after eating, may produce vertigo. When the giddiness is associated with congestion of the brain the face is flushed, and the arteries of the temples are distended. Giddiness of this latter kind has always a danger-

ous significance, and no time should be lost in consulting a medical man. It is met with in women at the two critical periods of life, when it is of less importance as a symptom than when it occurs in the male subject, particularly if he has passed middle age. Giddiness dependent upon insufficient blood-supply of the brain, is associated with faintness, pallor of the face, sighing respiration, and weak pulse. The ordinary fainting attack is of this variety, and in women subject to such "giddy turns" there is usually backache, irritability, pain in the side, menstrual disorder, and disturbed and weakened digestion.

Disease of the deeper portions of the cavity of the ear may be connected with a very serious form of giddiness or vertigo. There is often a discharge of matter from the ear, and more or less pain, or there may even be nothing of this kind. The individual suddenly becomes very dizzy, and turns usually from left to right, while surrounding objects become hazy and indistinct. He may have many of these attacks, and the chance of getting well depends much upon the condition of his ear-disease.

Certain grave diseases of the brain, such as tumor or softening, are not rarely symptomatized by giddiness. There are, however, other difficulties of a serious character, such as convulsions, headache of a severe character, disturbances of locomotion, paralysis or tremor, or other troubles of movement which may cause it.

Besides the causes enumerated, tobacco, used in inordinate quantities, will give rise to serious giddiness, great prostration, fleeting pains in the chest, palpitation and irregular action of the heart, sleeplessness, and defective mental action, expressed by feebleness of thought, impaired memory, and restlessness.

Numerous conditions enter into the production of the symptom besides those just mentioned, but it must be remembered that they all tend either to congestion or depletion of the brain; and powerful among these are malarial or other poisons, or exposure to the sun.

The treatment of giddiness depends very much upon its origin. In many cases simple attention to the commonest laws of hygiene will be followed by relief. Regularity and moderation in diet, the avoidance of active exercise after eating, moderation in the use of tobacco, or abstinence when its use is attended by "nervousness" or uneasiness, are often followed by subsidence of this disagreeable symptom. If there be hemorrhage of any kind, either from hemorrhoids or other diseases, medical aid should be promptly sought. If the person be of sedentary habit, there should be more exercise, sea-bathing, or walks in the open air. Overuse of the brain, through any kind of mental work, should be guarded against, and the neck

should be unconfined by tight collars or neck-gear. It is unwise also to sit beneath a hot gas-jet, or to wear the hat too constantly, for, in fact, anything which tends to keep the head hot is very bad for the patient.

If the trouble be connected with headache or paralysis, disturbance of vision, tremor, or other grave symptoms, the individual should lose no time in consulting his physician.

Sleeplessness.

No deprivation can possibly equal that of loss of sleep, so fraught is it with mental and physical exhaustion. Sleeplessness or *insomnia* is connected with a number of disorders, and may either be a symptom of disease well recognized, or a temporary disturbance, but in all cases there is more or less congestion, or other disturbance of the blood-circulation of the brain. In some forms of dyspepsia it is closely connected with hysteria and general nervousness. In such forms of wakefulness the patients are seized with sudden and voracious hunger, a sensation of gnawing at the pit of the stomach and faintness. In other cases the sleep may be of such a character as to cause the individual to awaken in the morning quite unrefreshed. It is heavy, almost amounting to stupor, and disturbed by dreams. In other cases the patient lies awake for a long time after he retires, his brain being preternaturally active, and ideas are evolved with startling rapidity. The senses are all acutely alive. Every sound is exaggerated and distorted by the individual's excited imagination. The head is hot, the heart beats violently, the feet are cold, and he tosses from side to side. This form depends usually upon overwork and mental excitement. The impression of some disagreeable idea, or some anxious care, will cause such a person great misery. He starts violently, or awakes again and again. The stupid, heavy sleep previously spoken of, depends usually upon a hearty meal taken just before going to bed. A close, badly-aired room, or one in which the plumbing arrangements are bad, will produce wakefulness, and, as a result, a headache follows in the morning.

The wakefulness of children has been before alluded to [see Vol. I.].

Various forms of troubled sleep, connected with somnambulism and nightmare, etc., are too familiar to need description. [See Vol. I.] Exposure to the sun during the daytime will often give rise to headache and sleeplessness, which are sometimes the precursors of disease of the brain. In fact, if wakefulness is connected with other nervous symptoms which are manifested for

some time, we have reason for alarm. There is no rule which can be laid down as arbitrary regarding the amount of sleep required by any individual. Old persons do not require as much as those of younger years, so it is a natural consequence to find that people of advanced life awaken at an early hour in the morning, while children whose nervous system is being developed must have ten or twelve hours sound sleep.

Treatment.—As sleeplessness so often depends upon a congested condition of the brain, it will be well to examine into the causes of such a condition. Mental labor has been spoken of as being a cause of this kind. In such cases work should be put aside an hour or two before bedtime and agreeable diversions resorted to. Sometimes when the individual has spent his time reading beneath a glaring gas-jet which heats his head, it will be found that if he seeks a seat away from the light, or if he bathes his head in cold water, the evil consequences may be avoided. A brisk walk, or gymnastic exercises of a moderate kind before bedtime will so equalize the blood pressure as to relieve the excited and congested brain. In some cases where there is excessive sluggishness of ideas, and stupidity lasting through the evening, a glass of ale or beer before retiring will secure refreshing sleep. Bad ventilation is a very important cause of sleeplessness, and the windows of the bedroom should be opened even if the room becomes cold. Hearty meals taken late in the day or at night, cause, in some persons, a want of sleep, and therefore should be discontinued. In this connection I would call attention to the pernicious habit of drinking sweet beverages, or eating just before bedtime, so commonly and frequently indulged in by young persons and children. A cold bath is advised by Doctor Flint as a remedy which often accomplishes much good, and may be tried in some cases.

In old persons it will be found that a half-teaspoonful of Hoffman's anodyne in a wineglassful of cold water will often bring refreshing sleep, but, as a rule, the use of anodynes is to be deprecated. Tincture of lupulin, in teaspoonful doses, or the bromide of potassium in twenty-grain doses, are the least harmful of all drugs of this kind, but even these should not be habitually taken.

In conclusion, a word of caution must be given to those who resort to opium or morphine for the production of sleep. The pernicious effects which follow the habitual use of these drugs are deplorable. The "opium habit" is sure to be contracted in the majority of cases. Regulation of daily life, appetite, and digestion; exercise in fresh air, and avoidance of excitement, are, after all, the best safeguards against sleeplessness.

Alcoholism—Delirium Tremens—Chronic Alcoholism.

The development of an immoderate appetite for alcoholic liquors is a most striking illustration of the *facilis descensus*, as the approach to the point where the desire becomes a diseased manifestation is so insensible and pleasant. The primary stimulation brings with it such a perfect intellectual sense of gratification: such a train of pleasant ideas; such a play of lively fancy: such a vividness of imagination, that the resulting reaction makes a fresh resort to the agent of such great temporary happiness an easy matter indeed. Upon various individuals the action of alcohol differs greatly. In some cases there is an apparent exemption from its early stimulating effects, and the primary indication of poisonous influence is then profound stupor. This is due, in some measure, according to Richet and other writers, to the ability of the individual to exercise his will in preventing the manifestation of morbid impulses founded upon disordered ideas. "In those cases, will and attention, although diminished, have not entirely disappeared, and the will is even concentrated on the fear of intoxication."

Constant immoderate indulgence in alcoholic beverages is sure to bring about a condition of poisoning of the nervous system, which is shown by a variety of curious symptoms more or less grave. The first term is applied to an acute condition, but may be a feature of what is known as *chronic alcoholism*, which is a more serious disease, and continues, if the bad habit is followed, until softening of the brain or severe organic nervous affections carry off the victim. *Acute alcoholism*, or delirium tremens, follows, generally, the excessive use of the stronger alcoholic liquors, but may appear after the sudden leaving off of spirits, and this form is common among sailors or soldiers deprived of stimulants, or it may occur in the midst of a debauch. In either case the outbreak of the disease is characterized by a period of excitement, hallucination, and excessive mental activity. The muscular system participates in the decline by expressions of feebleness. The hands shake tremulously, the patient is disinclined to take any exertion, and shuffles along in a demoralized manner. He is irritable and sleepless, and is at first dejected and sad. His face is pale and his eyes are red and bloodshot. Want of appetite, nausea, and constipation are complained of, and he finds it impossible to retain the simplest kind of food. The urine contains a heavy red sediment which clings to the sides of the chamber-vessel, and if some of this urine is placed in a test-tube and heated it becomes clear.

The first mental expression of the acute attack is deep depres-

sion. The individual believes that his friends have conceived a dislike and repugnance toward him, and he, in his own mind, is the most forlorn and wretched of his kind. Hallucinations and illusions are complained of. He sees imaginary reptiles and insects, vivid flashes of light, satanic imps, and hobgoblins. He has the morbid sensation that he is falling from a height; that ants are crawling over his skin, and that rats and mice are running over his arms and face. He becomes excited and maniacal, so that he can only be restrained by the greatest effort, and four or five strong men are required to hold him down. If he breaks away, he is liable to do himself and others personal violence through his delusions. He is destructive and tears his clothes, and breaks the furniture. Should he recover, he falls into a sound sleep, from which he awakes more or less refreshed, but is usually irritable and delirious. If a fatal termination follows the attack, he dies through exhaustion, for it is common to find that the patient neither eats nor sleeps for days, and his enfeebled strength is used up.

A much more serious condition follows the constant use of alcohol in quantities not sufficient to produce manifest drunkenness, but rather a depression of the nervous system, which, if continued, leads to all manner of organic changes. Tremor of the hands, more marked in the early morning, feebleness of both upper and lower extremities, entire numbness; or *hyperæsthesia*, which is increased sensibility, in various parts of the body, are prominent motor and sensory troubles. To these may be added headache, confusion of ideas, loss of memory, and slowness of speech. He articulates clumsily, and substitutes wrong words. He becomes slovenly in his dress, neglects his business, his whole disposition changes, and he grows irritable if not brutal to those members of his family with whom he may be associated. This condition of affairs cannot last long. Softening of the brain, loss of mind, and gradual breaking down of the body and mind follow, and death comes as a relief to the poor shattered victim and his friends.

This would hardly be the place to enter into the question of the physiological effects of alcohol; suffice it to say that the constant free stimulation of the brain is apt to lead to a pathological condition due to continued contact of alcohol with the delicate tissues of the nervous system. In countries where beer or the light wines form a part of the dietary of the people, chronic alcoholism is quite rare, and drunkenness is equally so; but in England, the United States, and some of the colder countries, strong alcoholic compounds are much more plentifully consumed than the lighter beverages, and, as a result, alcoholic poisoning is far too common.

This is especially true in England, where spirit-drinking is quite general. The use of alcohol at improper times seems to be fraught with danger. Early dram-drinking before breakfast, or between meals, or the taking of alcoholic spirits without water, are habits which all tend to the development of delirium tremens. The excessive use of alcohol in this way, of course, is connected with disturbed digestion and enfeeblement of the abdominal organs, and the mischief is increased by insufficient supply of nourishment and improper assimilation of food.

Treatment.—It might be well to preface the suggestions in regard to special treatment by a word of caution to those persons liable to be abnormally excited by alcohol. Persons of weak judgment, with the hysterical tendency, in whom, according to Richet, the "slightest access of fever brings delirium," should eschew alcohol. In those whose fathers or grandfathers were drunkards, the same caution holds good. The habit of drinking before meals is a bad one to acquire as, the stomach being empty, there is not only direct action upon its mucous coat, but the alcohol is very rapidly taken up. Persons in warm climates should be exceedingly sparing in the use of stimulants, and confine themselves to light wines and beer, if they drink at all.

For the relief of an acute attack of delirium tremens, sedative treatment is the most efficacious. Sleep should be procured if possible, and for this purpose bromide of sodium [in doses of twenty grains, dissolved in a wineglassful of cold water], the monobromide of camphor, chloral hydrate, and other hypnotics are used. The two latter should never be given, except with the advice of a physician. The patient should be made to eat, and if he will not partake of milk, beef-tea, and fluid nourishment, they should be given as enemata by the bowel, or through a stomach-tube. The digestive organs of the drunkard are in such a condition, the stomach being usually the seat of inflammation, that the patient commonly abhors food, and has no appetite. In such cases he may be given such alkaline waters as Vichy or Apollinaris, and these may be mixed with milk or, in lieu thereof, a pinch or two of bicarbonate of soda in a glass of cold water several times a day will afford relief. His bowels should be kept open with Rochelle salt, to favor elimination of the alcohol: should this remedy prove inefficient, any simple purgative or cathartic will be in order. The skin should be made to act by cold douches and shampooing, and absolute rest and quiet must be enjoined. The patient, should he be violent, must be tied down to the bed by a strap or strait-jacket: and, disagreeable as such a measure must be, it is preferable to the use of such violence as must be required to keep the patient from

doing himself harm. The expenditure of muscular force in the struggle with his attendants must exhaust the patient to a very great extent. Quiet and a darkened room is to be provided. For the treatment of the condition which remains after the acute attack has subsided, tonics are to be administered, and the use of iron, quinine, and cod-liver oil is advocated. A change of air and scene is also advised. The use of substitutes for alcoholic liquors is strongly to be deprecated. There is no article which can take the place of liquor without the danger of contracting another habit equally bad. Various compounds containing opium have been sold as "antidotes," and nasty mixtures of a bitter character are offered by quacks and others. These, as a rule, contain alcohol, and only derange the digestion, while they never do good. The use of "pick-me-ups" or "morning bitters," is an evil practice, and results in no benefit; but should the craving for the morning dram be very strong, a teaspoonful of the compound tincture of gentian, in water, may be taken with good effect before breakfast.

Hemiplegia.

Hemiplegia is a term used to express a form of paralysis which involves one lateral half of the body, and it may be either *complete* or *incomplete*, in regard to the loss of motion and sensation, or of motion alone, when we have the latter form. Hemiplegia is usually the result of disease of a blood-vessel upon one side of the brain, such disease consisting perhaps in the plugging up of the vessel by a little blood-clot from the heart, when a condition remains which is known as *embolism;* by the filling up of the vessel by local disease of its inner coat or sheath, or by clotting of blood in its interior, when the condition is known as *thrombosis;* or by disease of the vessel through fatty changes in its walls, and subsequent bursting—the condition being then known as *cerebral hemorrhage* or *apoplexy*. As a consequence of any of these accidents, the part of the brain supplied by, or in the neighborhood of the vessel, is subjected to dangerous pressure or loss of nourishment, so that its functions are impaired, and a paralysis takes place on the other side of the body. Such a paralysis is usually sudden, and except in the case of *embolism*, is attended by loss of consciousness.

Symptoms.—Except in the occurrence of *embolism*, which is a sudden accident, the other forms of hemiplegia are followed by premonitory or warning symptoms.

These are briefly—flushing of the face, headache, head discom-

fort after eating, flashes before the eyes, absent-mindedness and forgetfulness, clumsiness of speech, tingling in the soles of the feet, and in the skin of the side of the body likely to be the seat of *hemiplegia*. The attack of apoplexy itself may come on quite suddenly, the individual, however, often making some violent effort at the time, which tends to congestion of the brain. He falls to the ground unconscious, and if the apoplexy be serious, he breathes laboriously and violently, his cheeks being flabby, and blown in and out by each snoring respiration. His face is either livid, or purple and swollen, and his eyeballs are usually fixed, and look *away* from the paralyzed side of the body. The pupils will probably be found differing in size, and they do not act freely to bright light. The surface of the body is cold at first, then warmer; but if the patient is seriously ill, and likely to die, the temperature remains lowered. One side of the body, usually the left, will be found to be limp and powerless, and for some time there will be no indication of muscular strength. The paralysis may be of slower growth, and come on without loss of consciousness; but this condition of affairs is not so common.

In the case of *embolism*, the patient becomes suddenly paralyzed, but rarely loses his consciousness. There is, with these troubles, a loss of power of speech, which is most serious when the right side of the body is paralyzed, and this condition is known as *aphasia*, the person substituting one word for another, and being utterly unable to say what he knows, but cannot express. A patient, for instance, desiring a cup of milk, may ask for a "cup of cow." But the mistakes are usually far more absurd than this, words being used in the most eccentric and improper manner. Loss of writing-power of the same kind is quite commonly associated with the speech disorder. Of course, the duration of the paralysis depends upon the extent of the part of the brain destroyed. In persons of middle life, there is usually a tendency to recovery, the unconsciousness lasting from a few minutes to twenty-four or forty-eight hours, and the remaining paralysis disappearing gradually, so that walking becomes possible, and finally there is an almost, or quite complete restoration of strength. In other cases the arm and leg become deformed and twisted, and although much of the original power may be restored, there are muscular contractions which interfere with the proper use of the limbs.

There are persons who have other attacks, sometimes one, sometimes two or three, but it does not follow by any means, according to popular belief, that the third attack must necessarily be fatal. In old people, the occurrence of apoplexy is always serious and generally fatal. In young people, the hemiplegia is

due to plugging of the artery, or *embolism*, and very often the patient's chances are very poor, because of the tendency to softening of the brain, a diseased state which very commonly follows the deprivation of the brain of its usual amount of blood and nourishment.

Sometimes hemiplegia is followed by trembling of the arm or leg, and this condition is a serious one, though sometimes greatly benefited by treatment. Mental trouble, headache, blindness, and a variety of serious symptoms, are disagreeable sequences of the condition which produces the hemiplegia.

Causes.—In the case of embolism, and, in fact, of either of the brain troubles which produce the hemiplegia, heart disease plays an important part as a cause. Men are affected oftener than women, but it is a mistake to suppose that short-necked people are most subject to an "apoplectic stroke." Wiry, thin people of gouty temperament, are quite as often affected. Various constitutional diseases enter into the causation as well, as either exciting or remote causes. Intemperance and other dissipation, exposure to the sun, or violent muscular straining in any way, lead to, or directly produce the trouble.

Treatment.—The patient who has fallen after an apoplectic stroke should be carefully raised and placed upon a bed or in a chair, his head being elevated by pillows, while care should be taken to remove all tight neck-gear. The room should be cool and well ventilated, and crowding about the bed should be forbidden. Cool cloths may be laid upon the patient's head, and a physician should be summoned at once. In the absence of a physician it is safer to avoid active treatment, and to a great extent let the sufferer alone. If the bowels are confined an injection should be given of warm water and soap-suds, or *one* or *two* drops (*not more*) of croton oil should be placed on the tongue. The surface of the body should be kept warm and the head cool, and quiet should be insisted upon. Do not give alcoholic drinks unless the patient remains cool and unconscious for a length of time, and then but a few drops. Mustard plasters may be placed upon the calves of the legs, and the feet may be placed in warm mustard-water. Do not attempt to feed the patient if he is unconscious, but give him injections of bullock's blood from which the thick portion (fibrin) has been removed by a whisk-broom or whip of twigs. Use about a half-pint of this daily, upon two or more occasions. If he is conscious, he may take a little milk, but no solid food for several days, and it may be said that feeding of any kind must be carefully done.

Do not use electricity for several weeks to the paralyzed limbs,

but after this time it may occasionally do some good. It is advisable, however, as soon as possible to seek medical advice.

Paraplegia—Paralysis of the Lower Half of the Body.

Paraplegia or paralysis, which begins, as a rule, in the lower extremities, is a result of a variety of spinal troubles, usually of an inflammatory kind. It may appear suddenly or come on gradually. In the ordinary form, at some time or other, sensation and motion are rather sure to be lost or lessened. If the inflammation involves the entire spinal cord transversely, there will be a loss of this kind, as well as wasting of the muscles and involuntary discharges from the bowels and bladder. Bed-sores are quite apt to occur, and may be very deep and troublesome. The result, in a large proportion of such cases, is permanent paralysis, with rigidity of the limbs, though some cases may be cured. The thighs and legs may be drawn up, and such a condition, of course, is attended with utter helplessness. In other forms of paraplegia the loss is not so extensive. There may be paralysis of muscular power, while sensation is left undisturbed, and this condition is connected with great wasting of the muscles, the functions of the bladder and bowel being normal. This disease is then called *spinal paralysis of adults.*

Causes.—Disease of the coverings of the spinal cord, tumors in the spinal cord, and injury or disease of the bones of the vertebral column, may all give rise to various forms of paralysis of the lower extremities by pressure upon the spinal cord.

Syphilitic disease, exposure to dampness and cold, dissipation, and hereditary predisposition, are fruitful causes of the disease.

Treatment.—The administration of various constitutional remedies, such as cod-liver oil, phosphorus, and stimulating diet, is to be resorted to. Local treatment may consist of *massage* or rubbing, electricity, and baths of sulphur water, or cold water. The resulting deformities in old cases may be treated by mechanical apparatus with some hope of success. In the treatment of this, as well as many other forms of paralysis in which there is involuntary evacuation of the bowels and bladder, and a tendency to the formation of bed-sores, cleanliness is of the first importance. If bed-sores exist, they may be best treated by alternate local applications of heat and cold, provided by sponges dipped in vessels of iced and hot water, and by applications of soft cloths greased with carbolic ointment. It may be necessary to use mixed flaxseed and charcoal poultices when there are masses of dead tissue.

Locomotor Ataxia—(Tabes Dorsalis.)

When the posterior part of the spinal cord is affected, a peculiar form of trouble results. The patient first complains of "stabbing" and shooting pains which run from the feet upward or down the back of the thigh, and are worse at night. He has also pain which is superficial, and appears in spots upon the inner side of the thighs, these spots being exquisitely sensitive. He also has a girdle of pain about the waist. After a time he loses sensibility in his lower extremities, being unable to appreciate surfaces with which his feet may come in contact. He says that there is a sensation comparable to that which might be experienced if sand were in his shoes, or if his stockings were down at heel; his feet are cold; he complains of pain in his abdomen; he loses the acuteness of vision, and may become cross-eyed, but this latter is an early symptom. In the beginning, if he crosses his legs, and a tap be made with the side of the hand, just below the knee-cap of the hanging leg, the foot will not be thrown out as it is in health. His walk becomes peculiar, for he throws out his feet and comes down upon his heels, while his knees are stiff. He gradually becomes more and more helpless, cannot walk in the dark, stand with his eyes closed, or use his hands. He becomes weaker and weaker, perhaps develops pulmonary disease, and finally dies after a period of from ten to twenty years from the beginning of the disease. Throughout the malady there is constipation.

Causes.—Excessive dissipation has more to do with the causation of the disease than anything else. Among sailors who have fallen overboard, and those whose clothing has remained wet for some time, this cause has preceded the malady.

Treatment.—The treatment of this disease, which is a very hopeless one, can only be undertaken by a physician. Sulphur baths and galvanic electricity sometimes do good, and may safely be used by the patient.

Paralysis from Pressure.

Various transitory forms of paralysis may result from continued pressure brought to bear upon some nerve-trunk. A variety is met with frequently in persons who have slept with their arms in some constrained position—for instance, on the back of a chair.

Treatment.—Massage or rubbing, and electricity.

Facial Paralysis.

The muscles of the face are supplied by the seventh cranial nerve, which has two branches, one of which goes to the ear.

Three forms of facial paralysis exist: one of a superficial nature and affecting the muscles of the face only, and usually produced by exposure to cold wind. This is commonly contracted by persons who sit by the open window of a railroad car. The next is accompanied by deafness, and is due to pressure made upon, or disease of the nerve in the bone of the ear, or near thereto, and inside of the skull. This is a very discouraging affection, because of its lasting character. It follows pain over and behind the ear, discharge therefrom of matter, etc. The third form is of much more serious import, and is connected with drooping of the eyelid, suggesting that the brain itself is affected at a point where the third and seventh cranial nerves originate.

The appearance of a person with facial paralysis is decidedly peculiar, one side of the face being distorted by the healthy muscles of the other side, so that a peculiar grimace results. Owing to the paralysis of the lips the patient cannot whistle, or blow out a light, and when he spits, it is upon his clothing. The eyeball of the paralyzed side is usually exposed, and the individual cannot close his eye; the tears flow over his cheek and he suffers some discomfort from the lodgment of particles of dust on the front of the eye.

Causes.—Exposure to cold draughts, and rheumatism—otitis or inflammation of the ear, diseased teeth, tumors in the brain, and disease of the brain, may give rise to facial paralysis, the former to the simple varieties, and the latter to grave and permanent paralysis.

Treatment.—Faradic electricity to the face, used by itself, will cure most of the simple cases. A bent tin wire so contrived as to support the corner of the mouth on the paralyzed side, the other end being passed over the ear for support, may be used while the patient is in-doors, and often does much good. Medication should be left to a physician.

Neuralgia.

This term is used to express a condition of pain dependent upon impaired nutrition of the nerves, which is of so peculiar a character as hardly to be mistaken. While the pain of inflammation is usually at some time connected with heat of the affected parts, swelling, and the possible formation of matter or *pus*, that of neu-

ralgia is rarely associated with either of these, if we may except redness. This redness is, however, not limited. Neuralgic pain can scarcely be confounded with any other, and can never be forgotten by one who has suffered. It is sharp, cutting, boring, or stabbing, generally paroxysmal, and usually obstinate. It is not increased by pressure, except in spots where a nerve has been its seat for some time, and then only when the nerve passes over some bony prominence, or when it leaves the opening or *foramen* from whence it emerges to supply the surface of the body. It is sometimes associated with other nervous diseases, and quite commonly neuralgic subjects inherit it from nervous parents. It is, therefore, anything but uncommon to find neuralgia connected with epilepsy, or various functional nervous disorders, or in individuals whose family history shows the taint of consumption. Neuralgia may be also the symptom of some organic disease of the brain or spinal cord, and then has peculiarities which distinguish it from the *peripheral* or surface varieties. In spinal disease, the nerves which start from the spinal cord and pass to the anterior part of the body, or the sciatic nerves which extend down the back of the thighs, are its seat, or, more rarely, the large nerves of the arms are affected. With organic disease of the brain it is not rare to meet with neuralgia of the trifacial or fifth nerve of the cranial group, which supplies the face and top of the head; but in both cases there are other symptoms which are treated of in another place under the head of **Softening of the Brain, Tumor of the Brain,** etc.

The varieties of neuralgia are numerous, but the most common and familiar form is that which involves the great sensory nerve of the face and head. It may be confined to but one portion of this nerve, so that the upper or lower jaw is the painful site, or the pain may be general. In this variety but one side of the face and head is involved. The common form (see **Headache**) has already been alluded to. The attack, for such it is, may come on suddenly, but usually the pain is not so intense as it is after the paroxysms have been repeated, as they usually are. The suffering incident to this kind of neuralgia is intense. Violent outbursts of pain of a shooting character dart down the various branches of the nerve, one of which leaves the skull just over, and another beneath the eye, while the lowermost branch of the nerve (that supplying the teeth), is the seat of pain which gives rise to a violent toothache. The eyeballs feel as if they were being pressed from their sockets by some horrible pressure from behind, while the top and side of the head is sore to the touch, and the individual expresses his agony by saying that he "feels as if his head would split." Spots due to pressure remain, if the neuralgic attack has per-

sisted, and these may be found at the sites spoken of above, where the nerves take a superficial course. Sometimes the pain is connected with a spasm of the facial muscles, and this variety is known as *tic-douloureux*. Such muscular spasms occur apparently from no adequate causes whatever, excepting, perhaps, that the stimulating effect of cold air may have something to do with them. The patient's face is distorted and drawn upward on one side, so that he presents a lamentable, though extremely ridiculous appearance. When the nerve which passes to the back part of the head from below the ear is the seat of the disease, the affection is known as *occipital neuralgia*. The pain is not nearly so intense as in the preceding varieties, but is more dull and persistent, and does not possess the paroxysmal character to such a degree. It is commonly of malarial origin.

A somewhat rare variety is that which passes over the shoulder and down the arm (*cervico-brachial*), but it is most inveterate, and is accompanied very often by soreness and tenderness of the skin; not augmented by deep or firm pressure, but sometimes the slightest touch upon the skin will give unutterable agony. It is usually found on both sides of the body, and, as a rule, exists as a symptom of *spinal irritation*, or deficient nourishment of the spinal cord.

A form of neuralgia quite familiar to a great many people is confined to the spinal nerves which supply the upper half of the trunk, and called by a variety of names, such as, *intercostal neuralgia*, *pleurodynia*, etc. It is often mistaken for disease of the lungs, liver, or stomach, as the pain is complained of in the situation where these organs are located; but its most common seat is at the lower edge of the ribs. It is, however, unconnected with cough or other symptoms suggestive of disease of the thoracic or abdominal viscera, and lasts but a comparatively short time —a very short time if properly treated—but if not, is apt to recur constantly.

Another form of neuralgia is, like the foregoing, liable to be mistaken for organic disease—notably for disease of the kidneys. I allude to lumbago. The difference, however, is, that the pain of lumbago is situated in the "small of the back," while that of kidney disease is much higher up. Lumbago is constant and rebellious, and occurs in persons apparently healthy in every other way. It is usually a gouty or rheumatic variety of neuralgia, and the pain is increased by bending the body forward. At times the pain is paroxysmal and intense, but in the greater number of instances it has no such history, but is dull and persistent.

A variety of neuralgia of an important nature is *sciatica*, in

which the pain runs down one or both thighs, and is sometimes so severe that the patient is confined to his bed, or he is obliged to resort to canes or crutches for support. In *very* rare instances the limbs are shrunken ; more frequently, in old cases, they are cold, and the circulation is defective. A painful spot may be found here and there down the back of the thigh, but most constantly above, where the nerve leaves the pelvis. This form, when it be due to malarial poison, is exceedingly obstinate. It occurs in middle life usually, though no age is exempt, but younger subjects are more easily cured, as the trouble is then, as a rule, only functional.

Other forms of neuralgic disease are encountered. Neuralgia of gastric origin ; neuralgia of the heart; intestinal neuralgia, and various forms of trouble of internal organs of a painful nature are presented. As a rule, these painful affections depend upon some constitutional affection of the organ. It is sometimes gout, at others due to a degeneration or diseased condition of the blood-vessels. A form of the disease, excessively frequent, however, is ovarian neuralgia, which is either due to uterine or ovarian disease, and is connected with irregular menstruation, or accompanies spinal mal-nutrition. Young women suffer much more than those of middle or advanced age, and it is in many instances an accompaniment of the earliest menstrual periods.

Neuralgia is connected, in some cases, with changes in the skin ; sometimes with eruptions, and the familiar disease known as *shingles*, or *herpes zoster*, is an example of this kind. A circle of patches of eruption extends half way about the middle of the body, and is accompanied by some pain, not only about the spots, but radiating from the spine. Sometimes the hair changes color over the spot supplied by the affected nerve, so that a patch of gray hair in the midst of that of a darker hue is not an uncommon sight in inveterate cases of severe neuralgia. The nails and skin are occasionally the seat of changes, the former becoming horny and curved.

Causes.—Any influence interfering with the proper nourishment of nerve-tissue is pretty sure to give rise to neuralgia. This is especially true in nervous subjects. Insufficient food, bad air, dissipation, abuse of tobacco, of coffee, or of alcohol, exposure, late hours, want of sleep, intellectual fatigue, and malaria, are among these. Various special diseases play a part, and an important one, in the causation of the affection. The influence of gout is denied by some writers. Such a conclusion I believe to be unwarranted. Certainly rheumatism has much to do with the development of the disease, and very often the products of rheumatic inflammation

make dangerous pressure upon some nerve trunk, and give rise to irritation and disturbance of its function. Syphilis is often a powerful cause. Other diseases which produce anæmia, or interfere in any way with the nourishment of the nervous system, have a decided influence, and their name is Legion. Neuralgia is produced by a variety of other causes, some of them being often unsuspected. The existence of tumors, bad teeth, bony growths, broken or displaced bones, enlarged viscera, the presence of worms in the intestinal canal, uterine disease, will all favor the origination of various special forms of neuralgia. Malaria is probably one of the most fruitful causes, at least in this country, and an unsuspected exposure to the miasm will, very frequently, be the cause of a severe neuralgia, which may even follow it after an interval of many years. Neuralgia is rare before the fifteenth year, though children do suffer as well as adults.

Treatment.—An inspection of the causes will enable the reader to judge for himself how varied must be the list of remedies and their application. In one case a large dose of quinine (ten to twenty grains) will break up the attack, or in fact the disease; in others nothing will do good. In some facial neuralgias a bad tooth may be at the seat of the whole trouble, and relief follows extraction. Should malarial poisoning be suspected, a prompt and continued use of quinine will be the indication. If rheumatism is found to exist, the use of alkalies is suggested, and among these Rochelle salt in teaspoonful doses three times a day, may be tried. No special treatment can be laid down with any certain assurance of success. The patient should:

1. Break off all bad habits, late hours, the immoderate use of tobacco or alcohol (if used in excess). Take exercise in the open air. Seek a warm, yet not an enervating climate. Bathe in moderately cold water, or, what is better, take salt-water baths, and in either event use the rough towel or the flesh-brush. Secure, if possible, ten hours undisturbed sleep in the twenty-four. Take a brisk walk every day, and make your domestic life as different as possible from that of your business. If suffering from *sciatica*, do not attempt too much use of the lower extremities, nor err in another way by remaining in-doors.

2. Make the diet as nourishing as possible and avoid pastry, the indigestible meats (pork, veal, corned beef, etc.). Avoid such vegetables as cabbage, cauliflower, cucumbers, and others of the same class. Eschew condiments, hot cakes and hot bread; and if stimulants are needed, drink either a good light wine which is not sweet—such as claret, or if malt liquors are preferred, take lager beer or Scotch ale.

A means of treatment which may be used in all cases with benefit, is electricity. The galvanic current is that which should be employed, and the positive pole should be placed upon the spine, while the negative pole is held upon the limb below or on the painful part of the nerve. It is unwise to use this current except under a physician's guidance, but the Faradic current, which is commonly known and quite generally in domestic use, may be employed, and sometimes does much good. This is especially the case in lumbago and intercostal neuralgia or pleurodynia.

Local applications sometimes do good, and blistering may be tried with the expectation of relief. A little chloroform may be dropped upon a small piece of cotton, and this, in turn, be placed in a wide-mouthed bottle which is held against the surface of the body over the painful spot. Warm applications do great good in some cases, or cold may be applied locally. This is especially true in ovarian neuralgia, the ice being placed in a rubber bag and laid over the seat of pain above the groin. If a limb be affected, it will be found advisable to swathe it in cotton batting on which a piece of oiled silk may be bound. Various lotions and liniments have been recommended, most of which, however, do little good.

Epilepsy.

This disease, as it appears in infancy, has been described in the first volume of this work. It may pursue an uninterrupted course, beginning before the tenth year of life, or more rarely afterwards, and is usually a lasting nervous disease, though not necessarily a fatal one. The worst results are mental decay, and the appearance of other diseases. The epileptic attack may be but a momentary and fleeting loss of consciousness, or one of a profound character, accompanied by much muscular action, frothing at the mouth, and tongue-biting, the escaping froth being blood-tinged. The first stage of a convulsive attack is a rigid spasm of most of the voluntary muscles of the body, succeeded by spasms broken by intervals of repose, though these intervals may be so short as to be scarcely recognizable. The face is at first livid, and afterwards congested and swollen ; the patient then falls usually into a deed sleep, lasting two or more hours, though this may be absent. In nearly every instance the attack is preceded by a cry, or a peculiar sensation complained of by the patient, proceeding either from the pit of the stomach or the fingers or toes. This is called an *aura*. There may, however, be no warning whatever.

What is known as *petit mal* is a form of attack of a transi-

tory nature, which lasts but a moment or two. The patient may be seized at any time, as while walking across the floor, or while eating. His muscular trouble may be indicated simply by his dropping the fork or spoon in his hands, or his eyes may be rolled up and fixed.

There are various phases of epilepsy which are so rare that a description would be out of place in this book; I will refer only to the most conspicuous attacks of an irregular type, which consist of a kind of maniacal excitement following a fit or paroxysm.

Epileptic fits may occur at all times, the light and severe attacks together or separately. The most common time for the attacks is the early morning, just on awaking.

Causes.—Blows upon the head, hereditary transmission, intemperance, and organic disease of the brain, may be mentioned as common causes. Digestive disorders have much to do with the origin and continuation of the disease, and a form known as *gastric epilepsy* is simply a variety of attack, precipitated by an overloaded stomach. Imprudence in diet or habits, therefore, cause paroxysms, and it befits the patient to abstain from indigestible food or alcoholic stimulants. Exposure to the sun's rays has also much to do in exciting the paroxysms.

Course.—Epilepsy is a notoriously chronic disease, except when it is symptomatic of some irritating cause which may be removed; such as the presence of worms in the intestines, uterine disease, or accumulation of fæces in the lower bowel. When due to hereditary transmission it is rarely curable, and the same holds good when it follows scarlatina or other fevers, or wounds or blows about the head. It may continue to old age. When it is a symptom of brain tumor, or other destructive brain trouble, the patient's life will of course be shortened.

Treatment.—No one remedy has proved so successful as the bromide of potassium or sodium, given in from ten to twenty grain doses, three times daily in a half tumblerful of water. It is better, when the attacks occur in the early morning, to combine the doses, so that from forty to sixty grains are given at bedtime. The use of some simple bitter tonic is excellent. Tincture of calumbo, for instance, in doses of a teaspoonful, in water, before each meal, does great good. It may be necessary to give cod-liver oil and nutritious fatty food. A vegetable diet has been found, as a rule, to be the best. Avoid pork, corned beef, cabbage, cauliflower, carrots, turnips, cucumbers, pastry, and tea.

Coffee in moderation does good instead of harm, but it should not be taken oftener than once a day. Moderately cold baths at night, and spongings with salt water, are useful. When an *aura*

or warning is recognized, the simple act of cramping or forcibly flexing the toes or fingers will often prevent the attack. The same result is attained occasionally by giving a glass of sherry as soon as the warning is recognized.

Writer's Cramp.

This affection is one resulting from the overuse of one set of muscles in the act of writing, and is often complained of by clerks or others who do mechanical work, such as copying. When the intellect enters actively into the work, there is not much danger of the development of writer's cramp, for the affection is one of what has been called "hyper-automatism." Certain actions are performed by all individuals, with difficulty at first, and require the coöperation of the mind for a long time before they become automatic. Writing, playing upon musical instruments, the execution of various manual acts, are of this kind; but after a while the individual is enabled to perform them without much mental participation, so that to a certain extent they become unconscious efforts. Pianists can play and talk at the same time, and watchmakers, type-setters, or others, gain, after a time, wonderful ability to do two things at once, their hands doing one thing, while the mind may be engaged elsewhere. A very bad state of affairs may grow out of this development of faculty, and when writing especially is performed automatically, this serious condition of affairs may ensue.

The first indication of writer's cramp is a feeling of soreness and fatigue in the affected arm and hand. The fingers seem to lose their strength, so that the pen is managed clumsily, or in the other case, its point is with difficulty kept in contact with the paper, so that the words are formed slowly, and sometimes are but half written, when the hand is affected with a spasm or cramp, and flies upward and outward. If the act is persisted in, the trouble is very much increased, and sometimes even paralysis of the overworked muscles follows. If the individual learns to write with the other hand this, too, generally becomes the seat of the trouble, so that both hands are then affected. The disease is very persistent, and continues for some time, and always as long as the particular act is persisted in, whether it be writing, piano-playing, and so forth. Its symptom is very often vague pains in the shoulders, back, and back of head, which is increased by damp weather, and is often accompanied by numbness of certain parts of the hands. Cessation of the particular work is of the utmost importance, and neither recovery nor improvement can be expected

while the affected muscles are used. The use of the galvano-electric current, sea-bathing, change of scene and air, rest and quiet, moderate use of stimulants, and an animal diet, with free indulgence in milk, are recommended.

Wasting Palsy.

Wasting palsy, or progressive muscular atrophy, is a disease beginning usually in the hand of one extremity, though it may at first invade the legs and extend more or less, so that muscular groups of various parts of the body are finally involved. There are generally pains resembling those of rheumatism (and often mistaken therefor), which affect the arm and shoulder, and after a variable time, a commencing wasting of the muscles of the hands makes its appearance. After a period varying from a few months to a year or two, the palm of the hand loses so much of its muscular covering as to resemble the claw of an animal, and ultimately the arm, as well as the muscles of the forearm, are concerned in the atrophic or wasting process. The muscles of the shoulder are next involved, and, in turn, those of the back, neck, chest, and lower extremities, so that the miserable victim is reduced literally to a skeleton. It is only after some time that there is a loss of power. The muscles involved are the seat of little tremors, which somewhat resemble the appearance one might observe if there were a number of worms wriggling beneath the skin. The electrical current, after a while, fails to produce the slightest contraction of the muscles when passed through them.

FIGURE 147.—A case of wasting palsy, where the disease has extended to the muscles of the arms and shoulders.

The disease runs its course in from five to twenty years, and death takes place by an extension of the disease, which is spinal, to the medulla oblongata—that portion of the nervous tract situated between the spinal cord and brain. The general health is usually unaffected, except toward the end, when symptoms of exhaustion may show themselves, or pulmonary consumption may become developed.

Causes.—No cause is known, except that in some cases the dis-

ease has followed exposure to the elements, or has occurred in persons who have industriously and persistently used one set of muscles in the trade which they followed. It is found, for example, among tailors, dancers, telegraph operators, and blacksmiths. A remarkable feature of the disease lies in the fact that it is hereditary, and that families have been spoken of in whom several members were affected. The disease is luckily uncommon. The so-called "living skeletons" attached to "side shows" and public exhibitions, are striking examples of this disease in its advanced stages.

Recovery, though rare, is by no means impossible under careful treatment.

Treatment.—Nearly all good results, so far reported, have followed the use of electricity. No remedy of a medicinal character appears to have the least value.

Shaking Palsy.

Shaking palsy, as it is commonly called, or more properly, paralysis agitans, is exclusively a disease of old age, and rarely in any way shortens life. The first indication of trouble of any kind is a tremulousness of the hands, which becomes generally increased after a greater or less time, so that even the head bobs and shakes, and the whole body is agitated. When the patient is seated his body is bent over, his chin touching the chest, and his face wearing an intensely dejected expression. When he attempts to walk, his body pitches forward, so that he is obliged to run to keep his balance. In one form of the trouble (that due to hardening or *sclerosis* of the spinal cord and brain) the movements are increased with voluntary efforts, so that the more the will is exercised to control them, the more disorderly will be the movement. If he carries a glass of water to his mouth, it is apt to be shaken so violently, that the contents is spilt. As a rule, the tremor ceases at night. In aggravated cases, a species of paralysis, with deformity through contracture or distortion of the limb, follows.

Causes.—It has no apparent causes, except they be exposure, or hereditary tendency to nervous disease.

Treatment.—No treatment has, so far, afforded relief. Conium, the bromide of potassium, and many other drugs, have been tried ineffectually.

Catalepsy.

This very rare disease is found almost exclusively among women, though occasional examples are met with in the other sex. It is marked by the recurrence of fits which may be repeated several times in the same day. The features of the fit or convulsion are the following: The patient may experience headache, lassitude, dizziness, or trembling, and be suddenly stricken motionless, so that, if he be engaged in walking, or using either the upper or lower extremities in any way, they become fixed, and remain in whatever position they may be in, no matter how constrained. It is possible, however, for another person to bend the limb in a new position, in which it stays until the muscles become fatigued. The limbs feel semi-rigid, and as if made of wax or some half-resisting material, so peculiar is the contraction. The patient is utterly unconscious during the seizure, and remains so during its continuance, which lasts, perhaps, for an hour or two, or even for several days, but this is rare. The skin is numb and insensitive, so that pins may be thrust in to some distance without producing pain.

Cases of *trance* usually come under this head, and religious history is full of examples of what was simple ecstasy or catalepsy.

Fright, malarial poisoning, anæmia, or other impoverished states of the blood, enter into the production of catalepsy, and it is commonly a disease of early life. The prospect of cure is discouraging unless it be of malarial or emotional origin, and not connected with hereditary nervous disease or insanity. Cold water douches may be used during the attack, and the patient must be kept perfectly quiet. Should there be more than one attack, a physician should be called.

Ecstasy.

Ecstasy is but a variety of catalepsy, or a symptom of certain forms of hysteria. (See **Hysteria.**)

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INSANITY.

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INSANITY.

THE possession of reason is the distinctive mark of man's position at the head of the animal creation, and renders him a free and responsible moral agent. The loss or perversion of reason, to the degree to which it extends, limits or destroys man's independence and responsibility, and, if continuous, reduces him to a condition of complete helplessness.

At different periods in the world's history the views regarding the nature, origin, and treatment of insanity have been very diverse in character. At times it has been considered as a punishment for sin, inflicted by Divine displeasure; as a demoniacal possession; as a simple moral state for which the person was accountable, and as a mental condition due to the malign influence of the moon.

With these views of insanity, it naturally became a subject for the speculative discussions of philosophy. The insane were given over to the priests to be reasoned or prayed out of their unhappy state; or, still worse, they were punished for their perverseness, or left to suffer from cruelty and neglect. At a later period, when medicine began to be crystallized into a science, and insanity came to be looked upon as a physical disease, the sufferers from it passed from the jurisdiction of the philosopher and priest to that of the physician. The insane man was then found to be a sick man, and his condition was entirely changed. The cruelty, inflicted under the plea of driving out an evil spirit, and the neglect of the physical system, gave way to the law of kindness and the medical care of the body, as the true mode of treating what was ascertained to be a disease.

The theories which have gained standing in science regarding the nature of insanity may thus be formulated:

1. "Insanity is a disease both of the brain and mind."—This is the materialistic view, which considers mind as a secretion from the brain, or a mere physical substance, and mental disorder a disease of this secretion, or, as has been differently stated, "the mind is nothing more than the result of cerebral action." "When the brain is quiescent there is no mind." The tendency of this view is

to make man only what the material organ, the brain, may develop, and to limit his existence to this life and to the vital action of the brain.

2. "Insanity is a disease of the mind only."—This is the purely spiritual theory, according to which the mind is the immediate seat of the disease, and the mental disorder has its origin in error, sin, and passion. The belief in the power and presence of demons, in witchcraft and other superstitions, is a part of this view. It has been inculcated by the teachers of religion and philosophy, and retains the position, in the popular mind, of a traditionary opinion. Its influence is seen in the common use of the terms, "disease of the mind" and "mental disease." The logical conclusion of this theory is the complete annihilation of the mind, for disease implies destruction and death.

3. "Insanity is a disease of the brain only."—This assumes the existence of a soul or spirit independent of bodily conditions, so far as disease is concerned. The brain is viewed as the organ or instrument of the mind. Insanity is a complex affair, consisting of disturbed mental manifestations caused by disease of the brain. This theory is fully sustained by the researches of science. Aided by the microscope and the tests of chemistry, changes, not only of gross but of the most minute character, in the brain and its membranes, are brought to light. These may be represented by photography and preserved for subsequent examination and comparison. This method of investigation is now pursued, both in this country and abroad, and is giving most satisfactory results.

In every case of insanity in which a thorough microscopic examination of the brain is made, evidences of diseased conditions are found. The belief long entertained and expressed by those conversant with the subject, and who devoted themselves to practical investigation and study, that insanity exists only with disease of the brain, has been confirmed. It is not within the province of this article to describe the particular changes discovered. It is sufficient to say that in all cases of insanity some one or more of the tissues which compose the brain are involved; the membranes, the blood-vessels, the connective tissue, the nerve-tubes, and the ganglionic, or nerve-cells. The success of the modern treatment, which is founded upon this theory of the nature of insanity, attests its correctness.

Insanity may be defined, in a general way, as a more or less prolonged departure of the individual from the normal mode of feeling, thinking, and acting, the result of disease of the brain. This definition does not include mere delirium, which frequently accompanies acute diseases, such as fevers, inflammation of the

lungs, kidneys, etc., or injuries. The toxic effects of alcohol, and of narcotics, such as opium, hashish, belladonna, hyoscyamus, etc., must also be excluded. Mere eccentric, erratic, or other peculiar characteristics do not, of themselves, constitute insanity. Education, mental culture, the changes of social position, the acceptance of new views of life and duty, are all capable of transforming individual character and of producing an entire revolution of thought and action, but these cannot properly give rise to the suspicion of insanity. These variations of mental habit exist in health, with normal physiological action.

In insanity the changes in character present a wide range and are graduated from the lightest variations to those of the most marked kind. They are usually gradual, and develop step by step. The individual, from being cheerful and hopeful, may become moody and despondent; from being trustful and confiding, may become suspicious of all around him, or treat with indifference or even hate, those whom he is bound to love and regard. From being assiduous in labor, he may come to neglect, or lose all interest in his daily vocation, or new pursuits may be entered upon without thought or preparation. The careful, prudent man may spend his means in the most careless and reckless manner, or he may form new associations which ordinarily would have been most distasteful to him. The religious man may become profane, in disregard of his previous professions, while the wicked and vicious may seem to lament their folly and set themselves up for reformers. The temperate may give himself over to excessive indulgence, and the chaste and virtuous become lewd in speech and action. The honest may become dishonest, the truthful, untruthful, and the staid, quiet citizen may, by some criminal act, place himself in the hands of the law. Such transformations of character, when associated with, and dependent upon physical disorder within the cranium, mark the disease and clearly distinguish insanity from those moral perversities and personal idiosyncrasies which are perfectly compatible with normal mental operations.

It is to be borne in mind that each individual is to be taken as his own standard in judging of mental states. Comparison is to be made between the former and the present condition of the person whose sanity is in question. In this way, only, can allowance be made for natural eccentricities, for the accidents of birth, nationality, education, and the surroundings of life.

There are certain terms used in describing insane states which it is necessary to define. These are *delusion*, *hallucination*, and *illusion*. An insane *delusion* is a belief in that which does not exist, the offspring of disease of the brain, as when a man asserts

that he is dead, or that he is the third person of the Trinity, and cannot be convinced to the contrary.

A *hallucination* is a deception of one of the special senses; one who believes that he hears voices or sounds where there is complete silence, or that he sees objects where there is impenetrable darkness, is subject to a hallucination of hearing or of sight.

An *illusion* is an error or misinterpretation of one or more of the senses. A row of trees mistaken for a file of soldiers, or discordant sounds for the sweetest music, are instances of illusion of sight and hearing. That these sometimes occur when the reason is not affected is not denied. Delusions, which, in a general sense, are false beliefs, may arise from ignorance and superstition. Hallucinations and illusions may be due to a want of attention or to disorder of the special senses. The sane may correct them or be convinced of the deception or error, but the insane are not able to appreciate their true character, either by appeal to reason, to experience, or by the clearest demonstrations of their falsity.

Causes of Insanity.

Predisposing Causes.

Sex.—There are some causes of insanity which occur more frequently among men. These are exposure to extremes of heat and cold, the effects of intemperance and dissipation, bodily injuries, and certain forms of disease, such as rheumatism, apoplexy, paralysis, and syphilis. Women are subject to maternity and to diseases incident to their sex. Statistics show that more men become insane than women, and that the mortality is greater among the former. The difference in the number of the insane in the sexes is so fully accounted for by diseases and conditions which have no relation to the question of *sex*, that it is not necessary to give it special consideration in treating of the liability to the occurrence of insanity.

Age.—As regards *age*, the facts are very different. During the first ten years of life but few become insane. The diseases of infancy and early childhood that cause an arrest of mental development, result, usually, in imbecility. The changes accompanying puberty, which occur during the second period of ten years, are often causes of insanity, but the greatest number become insane between twenty and thirty years of age, and following closely in order, those between thirty and forty, and next those between forty

and fifty years. Attacks of insanity occur mostly during the years between twenty-five and fifty. This is the active period of life, when the energies of both mind and body are called into exercise, which often proves excessive, in the effort to succeed in the chosen fields of labor. It also includes the period of activity of the procreative functions, and of the climacteric in women with its changes in the physical system.

Civilization.—Insanity has been called a disease of civilized life. There are a greater number of insane among civilized nations than among the savage and barbarous. There are also more insane in the nations of Europe and America than among the older civilizations of Asia.

The liability to insanity among the former arises from two different causes. The one is the severe intellectual and emotional strain in the struggle for subsistence, for the accumulation of wealth, and for the attainment of the honors and emoluments of civilized society. This affects the intelligent, industrious classes. The other cause is found largely at the opposite extremity of society in the vices, in the indulgence of the baser passions, and the excessive use of stimulants, all of which may result in deterioration and disease of the system.

There is a difference of opinion among those who have given attention to the subject as to whether insanity is on the increase. That there is an increase in the actual number of the insane would be expected from the rapid multiplication of the population. That there is a relative increase may well be doubted, for when comparison is made between the present and the past years, it will be found that from the advance of science and from the spread of knowledge, the boundary lines of the disease have been widely extended, and many cases are now called insane which formerly were not so recognized: such as the enfeebled mental conditions arising from age, from paralysis, and from epilepsy, mild states of mental depression, etc. Moreover, until a recent period there were no reliable statistics of the number of the insane, while now every effort is made to find out and to enumerate all of the cases. The lives of the insane are prolonged by superior care and treatment, which adds to the actual number at any given time. The demand upon public charity for increased accommodations does *not* prove a relative increase of the insane, as is often claimed.

Social Condition.—The fact is fully established, by statistics of large numbers of the insane, that the family relation is conducive to health and sanity. More single than married of both sexes become insane, and of the widowed more women than men.

Heredity is the most important of the predisposing causes of insanity. By a law of nature peculiarities of physical structure and of mental constitution are transmitted from parent to child. In some families the form, the features, the height, the color of the hair and eyes, and even certain traits of character, reappear with such frequency that they come to be recognized as distinctive family marks. With the general resemblances of form and of mental organization there may also be transmitted a resemblance of elemental structure, or of constitution, which renders the members of the same family susceptible to like influences, whether they tend to the promotion of health or to the production of disease. Insanity is not directly communicated by inheritance. The heredity consists in a feebleness of constitution or in an instability of nerve element, which makes the individual liable to nervous disease or to insanity, when certain influences are brought into operation. The view that the disease itself is directly transmitted unfortunately holds a strong position in the public mind. The publication of occasional instances of families of which a number of members are afflicted tends to give currency and strength to this belief. The rule is that few are thus affected and the reverse is the rare exception. The popular idea is, that if insanity has once appeared in a family the descendants must become insane; and further, that where there is this heredity, it is such a taint that the disease is without remedy and the individual is hopelessly incurable. There is no such fatality attending hereditary influence, and though it increases the liability to the occurrence of the disease, much can be done towards its prevention by judicious care of the general health, by attention to the laws of hygiene, by special education, and by avoiding the known causes of the disease.

The chances of recovery from first attacks of insanity are not materially diminished by heredity, though the liability to their recurrence, under influences injurious to health, is somewhat increased. The probability of the inheritance of this infirmity of constitution in any case depends upon the number and nearness of kin of the relatives who have been insane. The liability is greatest when the disease has appeared in both branches of the parent stock; next, when in only one branch; and it is of less serious import when it occurs only in collateral branches, as among the uncles, aunts, or cousins. Sometimes the disease is strongly marked in one generation; in the second it may not appear at all, while in the following it may recur either in the form of insanity, imbecility, epilepsy, or some other of the diseases of the nervous system.

The frequency with which hereditary transmission is traceable

is variously stated as high as ninety per cent. and as low as ten per cent. of the cases from which the estimates are made. In the Asylum at Utica, N. Y., of more than eleven thousand cases, about twenty per cent. gave a history of heredity.

Exciting Causes.

Were it possible to enumerate all the assigned causes of insanity, the list would be found to include all the circumstances and conditions of the mental, moral, and physical life of man. It embraces all the emotions and passions, all the exterior surroundings, all the accidents and diseases to which the insane person may have been subjected. The closest scrutiny reveals nothing unusual, nothing which may not and does not often occur at one time or another to a large part of the human race.

All mankind are subject to the emotions of grief, joy, anxiety, and the like, as they are a part of man's nature. Many are bowed down under the disappointments of their hopes, the cares of family, and the perplexities of business. The excitements of religion and of politics permeate all strata of society. Changes in the conditions of life, from affluence to poverty, or the reverse, are so common as hardly to attract notice. Many receive bodily injuries, and still more suffer from some of the diseases which afflict mankind. With every child the mother incurs the risk of diseases of the puerperal state. By their vices and excesses many court the dangers that threaten ruin of soul and body.

It is not too much to say that all mankind are at some time subject to influences which may become, and often are, the exciting causes of insanity, and yet comparatively few of the whole number become insane. There must still be another element or factor to complete the history of causation, and this is cerebral disease. *It is not till the brain becomes involved, either primarily or secondarily, that insanity occurs.*

Causes are ordinarily divided into the two classes of *moral* and *physical.* The former includes all influences which act upon the body through the mind—as the emotions, passions, etc. : the latter such as act primarily upon the physical system—as diseases, injuries, etc. As moral causes are not operative till morbid physical conditions have been induced, these physical changes are by many considered as alone causative of insanity. The most prominent cause is *ill-health*, from overwork, grief, anxiety, fatigue, or loss of sleep. In this division is included a large number of cases, characterized by excessive mental action, emotional activity, or over-exertion of the physical system. These influences are thus

classed together, since their operation as causes of insanity is similar. They result in deterioration of the general health, in lowering the nutrition of the body, and, through disturbance of the circulation, in setting up morbid processes in the brain itself. Other cases are traced to *ill-health* from fevers and acute disease—as of the stomach, lungs, kidneys, etc.; to chronic constitutional diseases—as rheumatism, gout, syphilis, etc; to diseases of the circulatory apparatus—heart, arteries, etc.; to diseases of the nervous system—as neuralgia, chorea, epilepsy, locomotor ataxia, tumors and softening of the brain, inflammation of the membranes or coverings of the brain, etc., to diseases of the puerperal state and the climacteric, uterine disorders, self-abuse, intemperance, narcotic poisons, etc.

Classification of Insanity.

Different classifications have been adopted by authors, according to the view held regarding the nature of the disease. Those which have attained the most prominent position in the literature of the subject are the following:

1. The classification founded upon the supposed analysis of the mind which includes the various mental and moral faculties; whence we have Intellectual, Perceptional, Emotional, and Volitional Insanity. From this arises what has been called moral insanity, and, as subdivisions of it, the different propensities which the insane sometimes manifest are elevated into classes, such as Pyromania, a mania for burning; Kleptomania, a mania for stealing; Homicidal and Suicidal mania, etc.

This is an outgrowth of the idea that the mind may be actually separated into different faculties, and further involves a belief that one portion of the mind can be insane and all the rest perfectly sane.

2. A classification arranged according to causes of disease or peculiar physical states which underlie the insanity. From this system arises syphilitic, rheumatic, epileptic insanity, etc., or the insanity of pubescence, of pregnancy, of lactation, etc.

This, though a rational method, is impracticable, in that it fails to cover the whole ground, as in many cases a variety of causes act consecutively or together, so that it is impossible to express them by any single term, however comprehensive.

3. The classification founded on the type of the mental symptoms. In well-marked cases this is most readily appreciated by the ordinary observer. This system is generally adopted in this country and abroad by both the medical and legal professions.

FIGURE 148.—Mania.

FIGURE 149.—Chronic Mania.

FIGURE 150.—Melancholia.

FIGURE 151.—Dementia.

FIGURE 152.—Paresis.

The principal divisions are *Mania*, a state of mental exaltation; *Melancholia*, a state of depression; and *Dementia*, enfeebled or diminished mental activity. Mania and melancholia are both states of increased mental activity. They are produced by the same causes, present the same morbid conditions, but differ in the character of the mental symptoms. The one class of cases is marked by mental exaltation and expansive ideas, and the other by mental depression and circumscribed and painful ideas.

Mania.

This general term is subdivided, according to the duration and severity of the symptoms, into acute, subacute, and chronic forms; and further into paroxysmal, periodic, and recurrent.

Acute mania, or the raving madness of popular belief, is easily recognized. Most cases present disturbances of health as precursors of the attack. There is sleeplessness, variability of appetite, disturbance of the stomach or bowels, or of the secretions of the skin, kidneys, or other parts of the physical organism. There is usually, preceding the maniacal disturbance, a period of depression varying from a few days to several weeks, varying in degree in different individuals. He loses interest in his affairs, is inclined to avoid people, or to seclude himself. This is succeeded by a state of excitement and restlessness, and delusive ideas are formed. He is often suspicious, fearful, asserts that his friends are his enemies, and are trying to poison or injure him in some way, and for this reason turns against them. On the other hand, he may be cheerful, gay, and express himself as feeling well, better than ever before; that he can undertake anything in the way of business or physical exertion. Soon these delusive impressions assume definite form, usually regarding personal affairs: that he is possessed of great wealth or power, and he may form plans for using these for the benefit of friends or the community, or his enlarged views may include all mankind. He becomes restless, perhaps attempts to carry out his plans, and, if opposed, breaks out into threatening speech or open violence.

Of the physical conditions at this period, it may be observed that there is usually inability to sleep, perhaps for days together; the appetite may be good or impaired, and the muscular activity is marked by the rapid play of the features and the movements of the body. Occasionally there is increased temperature, dryness of the tongue, feebleness of the circulation, and such vital depression as betokens danger to life. This state is not unfrequently mistaken for one of fever. In the progress of the malady the mania

increases, and is indicated by noise, boisterous conduct, and violence. The mental activity now reaches the point when ideas pass too rapidly for full expression, and there is incoherence in speech.

Prominent among the symptoms is destruction of clothing and furniture, opposition to necessary care, profanity and obscenity, and even indifference to the calls of nature. Hallucinations and illusions frequently arise with the definite delusions, and imaginary voices are heard or conversations held, or objects are misinterpreted. This condition may continue for weeks or months. The greatest liability to death is during the early stages, from sudden exhaustion; but the tendency in simple acute mania is towards recovery. This occurs usually by gradual subsidence of the symptoms coincident with improvement of the physical health, as shown in the increase in appetite and flesh, with quiet rest at night. In this process the delusions are given up, and their true nature is for the first time appreciated by the patient. Convalescence thus begun may, under proper care, result in complete recovery. Should the disease continue, it may pass into the *chronic form*, or into a condition where there are periods of quiet alternating with paroxysms of excitement, or, finally, into the mental enfeeblement of dementia.

When it reaches the chronic stage, there is frequently the same incoherence of speech, the same violent, noisy, or boisterous conduct, and the person may continue destructive, profane or obscene, and careless in habits. The term chronic refers to the duration and fixed character of the disease, as well as to a change in the symptoms. In other cases there is a subsidence of symptoms both mental and physical. The person is quiet, coherent in speech, regular in habits, well behaved, in good flesh and fair general health, and, to the casual observer, may even seem sane, as the delusive ideas, though fully established, may be concealed. They often take the form of suspicions, of dislike to friends, of fears of conspiracy, of being poisoned or injured in reputation or person, of being affected by electricity, mesmerism, or some other influence exerted by one or more persons. Delusions of this character are liable to make the subjects of them dangerous to the life or property of those regarding whom they are entertained, and not unfrequently bring them under notice of the law for acts committed.

The chronic maniac may hold delusions relating to his personality: that he is some noted individual, as an emperor, and under their influence he may decorate his person with colored rags, buttons or paper, or in other ways indicate rank and assume authority over and dictate to others. No refusal to obey, or incongruity

in the assumption with the surroundings or position, for a moment disturbs the belief. There is a great variety of delusive ideas among the chronic insane, but the most common are in the direction indicated. This form of disease is rarely recovered from, and the tendency is towards a gradual decline of mental power.

The *subacute* form is characterized in the same general way in its inception and early history as the acute form, but it is not, however, in its progress so fully marked by violence, incoherence, and mental disturbance. The delusions generally control the person, but, being less noticeable in the conduct and more concealed. Cases of this kind are really more dangerous than the noisy, boisterous maniacs, who are quickly put under charge. The duration and the results of treatment do not vary essentially from those of the acute form. Recovery from attacks of mania usually takes place within eighteen months from the commencement of the disease, and comparatively few recover after two years or more.

Melancholia.

Melancholia, or the form of insanity characterized by mental depression, occurs next in frequency to mania, and in its inception closely resembles it. There is the same insomnia, loss of appetite, and physical disturbance. The person is despondent and apprehensive, seeks to be alone, and is absorbed in gloomy contemplation. The thoughts are turned inward, and so concentrated on self that there is an inability for exertion and, following this, a loss of interest in business and affairs generally.

The melancholic is unhappy and restless; there is, to him, nothing cheerful or hopeful in his condition or prospects; this gloomy view may be limited or extend over his whole life. He may consider his ordinary acts wicked or even criminal. All the misfortunes which occur, or of which he may hear or read in the papers, he may attribute to his own wickedness, and accuse himself of the most heinous crimes. Remarks of persons which have no reference to him or his state, he may construe into accusations against himself. He often asserts that he is pursued by officers of justice for his crimes, or believes he has committed the unpardonable sin, or that he has lost all his property and has beggared his family; that he is doomed to starvation or the poor-house, and has involved his friends in everlasting disgrace or ruin; that his health has been undermined by some terrible disease; that he contaminates everything he touches; that some dreadful fate awaits him, and he is to be arraigned, hacked in pieces, torn asunder upon

a rack, or burned in a furnace, or that he is dead and all the functions of life are suspended.

Thoughts of suicide occur early, and often become intensified with the development of delusions. These may be openly expressed or wholly concealed, and the suicidal attempt may be the first indication of their existence. About thirty-five per cent. of all cases of melancholia admitted to the Asylum at Utica had attempted suicide while with their friends, and a still larger percentage had entertained thoughts or made threats of committing suicide. To avoid the dangers which, under such delusions, they believe threaten those near and dear to them, melancholics are sometimes led to commit the most fearful crimes : as the mother to take the life of her innocent offspring, or the father to destroy his wife or children, or both.

Hallucinations of the special senses and delusions in regard to taking food are quite common : such as the belief that it does not nourish, but simply accumulates in the body, and that, therefore, it is impossible to eat ; that the throat has grown up and food cannot be swallowed, or that it is wicked to prolong life, or that, by eating, one's family will be starved ; or that what is taken can never be paid for. Under such delusions all nourishment may be persistently refused, and if it is not administered, the strength fails rapidly and death soon closes the painful scene.

In other cases the person walks to and fro, regardless of the demands of nature for repose, wringing the hands, moaning and lamenting. Sensation seems lessened, the nails are bitten off, or the skin is picked till the blood flows, or the hair of the head or the beard is pulled out. There is extreme restlessness and sleeplessness, rapid emaciation and general disturbance of the secretions. The feet and limbs swell, the extremities are cold, and the circulation is languid and imperfect.

In the course of the attack periods of frenzy sometimes occur, in which the person may abuse himself or injure others, and exhibit uncontrollable violence. Occasionally the melancholic passes into a condition of apparent stupor. He sits or stands in one position, with the head dropped on the chest and the hands hanging helplessly by the side. Food is only swallowed when placed in the mouth, and there is utter indifference to habits of cleanliness. No response can be gained to questions, and no sign of recognition is given. The mind, however, is generally active, and everything said or done in the presence of the person may be understood and appreciated, though the influence of delusion seems profound and the mental abstraction apparently complete and controlling. This state may be mistaken for trance or ecstasy, or profound dementia.

Sometimes, in the course of melancholia, paroxysms of mania alternate with periods of depression. Cases of simple melancholia, if placed under treatment in an early stage of the disease, usually recover. Where the result is not favorable, the termination, as in mania, is mental enfeeblement.

Dementia.

Dementia is the final stage of mental impairment, towards which all cases of insanity that do not recover tend. In this condition there may be coherence of speech and correct answers given to questions relating to the former life or present surroundings, but there is a loss of spontaneity and an inability for continuous mental effort. When compared with the normal state, the mental horizon is limited, the person drops to a lower plane of mental activity, whether relating to social duties, business affairs, or moral responsibility.

Frequently the failure of memory, especially of passing events, from loss of the power of attention, is a prominent feature. The emotional nature is enfeebled and perverted, and the demented person becomes more or less insensible to any permanent sentiment of love or hate, though there may be transitory exhibitions of feeling, as affection or jealousy, or sudden outbursts of laughter or passion, from the most trivial causes. The delusions, though still existing, are vague and often ill-defined. As the degeneration progresses, the ideas and conduct become silly and foolish; there is a neglect of dress and habits, and a tendency to accumulate and secrete worthless articles and rubbish upon the person or elsewhere. This stage is often a protracted one, lasting for years, but with a steady decline towards the final state of complete mental obscuration, in which there is utter indifference and helplessness.

In dementia the organic functions are not disturbed in proportion to the mental deterioration; the appetite is usually good and even voracious, the sleep sufficient, and the flesh retained or increased. The sensibility to all outward impressions is diminished, as well as to the sensations of heat and cold. Care and treatment may ameliorate the condition, but will not effect recovery in confirmed dementia.

Paresis.

There is another form of insanity, which is sufficiently distinct to merit separate notice. It is *General Paresis*, or *Paralysis of the Insane*. It is, compared with other forms, of infrequent occur-

rence, and is always fatal. As to sex, there are, in this country, about twenty cases among men to one among women. The paralysis is of a progressive character, and is manifest in a tremor of the lips in speaking, of the tongue when protruded, and of the fingers when the hand is extended. The first indication to friends is generally in the change of conduct of the individual. This is manifested in extravagance of speech or action, or in the direction of unusual indulgence in drinking or other excesses. The careful man of business may talk extravagantly of his prospects, or plans, or make extraordinary or useless purchases without provision. The temperate man may begin to drink, or the one accustomed to the use of liquor may indulge more freely, or give himself up to the control of his appetite. The person affected in this manner is coherent in speech, complacent, and generous to friends and even strangers, though irritable if crossed in his purposes. Remonstrances against his conduct are unheeded, and suggestions that he is unwell, or overworked, are met by the assurance that he never was so well; that he is stronger and in better health than ever before. The physical and mental symptoms increase in severity; light paralytic seizures, or "fainting spells," as they are often called, are followed by a slight change in speech, a tripping of the tongue, an elision of certain syllables or words, or a thickness of enunciation resembling that of intoxication. The gait is changed and becomes shuffling, the feet are set more widely apart to increase the base of support; the handwriting is noticeably altered, the letters are angular, syllables and words are left out, and the lines are irregular.

Delusions are expressed of the most exalted character. The paretic claims to be worth millions or billions of dollars, to possess the most valuable gems in unlimited quantity, or to own the gold mines of the world. If the delusive ideas relate to his own personality he may assert himself to be the most successful merchant, or the most skilled artisan, or to be able to perform the most wonderful feats of strength, to move buildings or cities, to build railroads across continents or over oceans; he may imagine himself to be the President or an Emperor, the ruler of the world, or even God himself.

The paretic seizures become more severe, and take the form of convulsions, with periods of unconsciousness lasting for hours; and though the person may rally, he does not regain his former state, the mind is more feeble and the speech and gait more disturbed. Successive attacks occur, finally inducing coma, which may terminate in death; or this may take place suddenly from hemorrhage into the brain. The duration of the disease is usually from

eighteen months to four years. It occurs most frequently among the intemperate and those who have freely indulged the baser passions, but it may result from overwork, either mental or physical.

From the insidiousness of its approach, the apparent insignificance of the symptoms in the earlier stage, the character and gravity of the disease are seldom appreciated, and false hopes of speedy recovery are often entertained by friends. The individual who is thus afflicted is often thought to be under the influence of intoxicating liquor, and is held to a moral and sometimes legal responsibility when in an utterly irresponsible state from disease.

In the foregoing, descriptions of well-defined cases of each form of insanity have been given, and some subdivisions, found useful in science, have been ignored as not having a place here. They are sufficient, however, to convey to the reader a correct idea of what insanity really is, and of the changes it produces in the individual. Absolute lines of demarcation cannot always be drawn, since the symptoms of different forms are sometimes so intermingled, or shade into each other, as to make the classification difficult except after a thorough examination of each case.

Early Symptoms of Insanity.

The outbreak of insanity may be sudden and entirely unlooked for; but there is usually a period of inception, during which such changes occur in the mental and physical condition, as, if properly interpreted, would indicate the danger which threatens. These are sufficiently common, in the great majority of cases, to be recognized as symptoms of an approaching attack. The first thing to be noticed, as an evidence of a disturbed condition of health, is the loss of the accustomed amount of sleep; or there may be entire sleeplessness, continuing for several nights in succession. Headache is often present, either continuous or intermittent; general or limited to certain portions of the head. There may be a piercing or throbbing pain, a sense of weight, or of pressure, or of fulness, or a feeling as of a band drawn tightly about the head. There is, in some cases, great muscular restlessness; the person is almost continuously in motion, and unable to be quiet and ordinarily composed. In others there is a disinclination to muscular action, which is only overcome by strong effort and determination. There is either loss or variability of appetite, and disturbance of digestion, which soon affects nutrition. The natural functions of the system are sluggishly performed, and constipation of the bowels and diminution of urinary secretion may follow. Disturbances of sensation are common, as flashes of heat or shivering, and

coldness of the extremities. The countenance often loses the hue of health, and becomes sallow or pallid, and assumes a care-worn, haggard look. The skin is sometimes relaxed, and perspiration is profuse on slight exertion, or on the other hand it is dry and harsh and does not perspire.

The first mental symptoms are manifest in the sphere of the feelings, by a departure from the normal emotional state to a condition of depression or excitement. A person becomes gloomy, unsociable, and inattentive in his domestic life ; seems absorbed in moody abstraction and loses interest in his affairs. Though he may continue regularly to attend to his ordinary duties, they are performed in a routine, listless, or anxious manner. He may have gloomy forebodings, or apprehensions of some vague danger that seems imminent. There is great indecision in forming judgments and in action. A decision made is regretted and recalled, and whatever action is taken the person is unhappy and unsettled and wishes he had done differently. Business may be distasteful and approached with dread, and yet the person cannot be induced to intrust it to another.

At this stage there is frequently a realization of the true condition, which is evident in the often-repeated remark : "I do not know what is the matter with me ; I fear I am becoming insane." In other cases the disease progresses without any declaration or recognition of the changed state. Restlessness and inability to apply the mind to external affairs increase, and the person is finally wholly taken up with his own unhappy state. After a longer or shorter period, suspicions and delusive ideas are openly expressed, and then the *melancholia* is fully established.

In another class of cases a stage of excitement follows, more or less closely, upon the first change to gloominess and depression. The person becomes irritable, exacting, irascible, treats his friends and family with rudeness and harshness, is captious, unreasonable, restless, and uneasy. As regards personal habits, there may be a loss of taste and care, or there may be over-nicety in dress, or an unusual indulgence in drinking, in the use of tobacco, or other excesses. Sometimes there is extravagant expenditure for the household or for personal adornment. In business relations the ideas are expansive, and transactions are made without ordinary care or caution. There is often an unnatural brilliancy and rapidity of thought, which, however, is neither logical nor controlled by judgment. Whatever is undertaken is either imperfectly performed or left undone in the haste to attempt some new project. Confusion and irregularity take the place of order and system. Suspicions are often entertained of those who have been

held in full confidence. This condition may continue for weeks or months before the friends appreciate the gravity of the case, and then, often, only when it terminates in an attack of *acute mania*.

Treatment.—It is in the home-life of the individual that these changes occur, and it is during this period that treatment directed to the prevention of the attack must be employed. This can usually be done only under the direction of a competent and judicious physician. Friends are generally powerless, as they fail to gain the confidence of the sick man and satisfy him that any action is necessary. If the physician is successful in this, an important point is already gained. A plain, truthful statement of the actual condition of the patient should be made to the friends, setting forth the changes in the mental and physical state, their import, and the danger which threatens. The patient should also be treated with candor and without deception, care being taken not to excite the fears unduly, so as to precipitate the trouble that it is desired to avert. There are certain requirements to be observed in the treatment,

First: Diminish the hours of labor and responsibility; increase the hours of repose. Sometimes it may be necessary to give up all business for a time and seek a change of all surroundings, or complete rest at home. In cases of depression, travel and an entire change of scene are often recommended, and in some instances are beneficial. They are not, however, to be advised indiscriminately, as they are generally injurious when the patient is wearied by the annoyances of travel, or is too depressed to enter into the enjoyment of the incidents, and of the varied scenery of the journey. It is only harmful to compel those who are in feeble health, and whose minds are so preoccupied with their own unhappy state as not to respond to the stimulus of active life around them, to leave the comforts of a well-regulated home and endure the discomforts of living in a hotel, and the irregularities inseparable from travelling. Such persons are more likely to be benefited by the care and nursing of friends at home, or, if any change is deemed advisable, it ought to be to some quiet place where ease and comfort and proper treatment are assured. Change of residence is to be sought when depressing moral influences, unpleasant surroundings, or unhealthy conditions exist at home. These will be readily appreciated both by the physician and friends. All efforts towards moral treatment should be tempered with judgment, avoiding such continuous effort to divert and amuse as annoy and weary the patient, always remembering that notwithstanding there may be a semblance of health and vigor, the condition is one of debility and lowered vitality.

Second : Sleep must be secured, if possible, in amount equal to that ordinarily demanded by the individual when in a state of health. Regular and early hours of retiring should be enforced ; these increase the probability of gaining repose and additional hours of sleep. Warm sponging of the body, and especially of the spine, allays muscular restlessness and is quieting to the nervous system. Bread and milk, warm gruel or beef-tea, or a glass of ale with bread or crackers, taken on retiring, often insure sleep. If these measures are ineffectual, the prescription of the physician should be employed. The remedies most commonly used are the elixir of the valerianate of ammonium, the bromides of ammonium or of potassium, opium in its various forms, hyoscyamus, cannabis indica, lupulin, sumbul, and chloral. The choice of the remedies, the amount and combination, depend so much upon conditions of the system, and the indications to be met in each individual case, that the medical adviser is the only one competent to direct.

Third : The question of nutrition is one of vital importance. In most cases there is either a loss of appetite, a disinclination or a neglect to take sufficient food. This tendency on the part of the insane to neglect or to refuse to take a proper amount of food should be borne in mind, and also the additional fact that, to repair the constant and unusual waste of the system, nutritious food is absolutely demanded, and most frequently in quantity equal to that appropriated by the individual when in a state of health. It should be taken as a matter of duty, without reference to inclination or appetite. Much can be accomplished in this direction by insisting, when practicable, that the patient continue the accustomed meals of the day and at the regular hours. Regularity in the habit of eating is too important an element of hygiene to be yielded to the desire of the patient or to his reiterated assurances that he cannot eat or does not need nourishment.

If the supply of food taken at the regular meals is insufficient, additional varieties may be prepared, such as the patient is known to like, or such as will tempt the appetite. A full amount, of proper quality, without the restriction of dieting, is to be aimed at. Among the articles of nutriment, milk stands at the head. This is most readily obtained, the most universally acceptable, and the best ; it can be given with the meal, or as a part of it, or the patient may be induced to take it between the regular meals of the day. If desired to increase the nutritive quality, eggs can be broken into it and sweetened to the taste. Gruel, soups of various kinds, or beef essence, all of which should be well seasoned and given warm, are eligible forms of nourishment. Fruits are valuable as acids ; they improve the secretions, act as laxatives, and often regulate

the action of the bowels without the aid of medicines. By tact, persuasion, and by taking advantage of the moods of patients, sufficient nutritive material can usually be given, and it must not be neglected.

Of the remedies to be employed to increase appetite and to meet the varying conditions presented in each case, the physician can be the only correct judge. The following are frequently prescribed : The preparations of iron, the vegetable tonics—as gentian, cinchona and its alkaloids, quinia, etc.—columbo, quassia, nux vomica, strychnia, pepsin, lactic and hydrochloric acids, ale, wine, whiskey, cod-liver oil, phosphorus, ergot, the bromides, opiates, iodide of potassium, the various cathartic and laxative medicines, etc. There are few forms of disease in the proper treatment of which the skill of the physician and of the pharmacist are equally taxed.

It is now left to consider what is to be done, when the early symptoms having passed unrecognized, or the efforts at prevention having proved unsuccessful, the disease has become fairly established, or where the outbreak has been sudden and severe in character. When there exists the ability to provide proper medical attention, nurses, and care, certain classes of the insane may be retained at home : such as those with the mental enfeeblement of age, with paralysis, or general paresis without violence, cases of simple melancholia, of subacute mania, of chronic insanity and epilepsy without delusions tending to suicide or homicide or to the dislike of friends, and cases that are quiet and do not oppose care or the taking of food or medicine. On the other hand, forms of insanity characterized by delusions which may lead to destroying life, or to resisting necessary care, or to the persistent refusal of food, or in which there is noise, violence, sleeplessness, destructiveness, exposure of person, obscenity or profanity, delusions of suspicion, of being poisoned or injured, or of dislike of friends, or where there are efforts to escape from the restraints imposed at home, necessarily demand the means and mode of treatment which can only be found in the special care of a hospital. When the friends are unable to provide for the patient at home the public is usually called upon to assume the charge, and the insane person is then placed in an institution. Whatever the decision, whether the patient is to be kept at home or sent to an asylum, there should be no delay in placing him under proper medical care. The importance of this can hardly be overestimated, as statistics show conclusively that the shorter the duration of the disease the greater is the probability of recovery under appropriate treatment. It is computed that of cases treated in asy-

lums, where the insanity is of not more than three months' duration, about seventy per cent. recover; while of those who have been insane for twelve months the percentage of recoveries is only about eighteen; after a duration of two years the percentage falls to an insignificant figure. Of those treated at home no statistics are available; but it is considered a well-established fact that, considering all forms of insanity, the probability of recovery is largely increased by removal to an asylum.

Insanity is essentially a chronic disease, and the morbid changes of the delicately organized nervous tissue are not recovered from until after a comparatively long period of continuous treatment. Under the most favorable conditions few recover in less than three months, more after six months, and a large number after one year. This should be taken into consideration in the decision as to place of treatment. Many would retain their friends at home if there was a favorable prospect of their recovery within a few weeks, as in many acute forms of disease, who would find it impossible to care for them as many months.

The annual death-rate among the insane in institutions, reckoned upon the total population, varies from three to seven per cent., the general average being about five per cent. The highest rates are found in such as receive exclusively either the acute or chronic class in large numbers. The lowest percentage is in those which receive a mixed class in small numbers annually. The average duration of the insane life in those who do not recover is variously given. The lowest estimate is eleven years and the highest twenty-one. The one quite generally accepted is about seventeen years.

Asylums for the Insane.

The manifestations peculiar to insanity led to the establishment of institutions for the care of the insane. For many centuries and till a comparatively recent period they were merely receptacles where the insane were imprisoned in cells, often loaded with chains, and at times left to die of starvation, in filth and squalor. The earliest asylum known existed at Jerusalem, in the fifth century. The insane colony at Gheel, in Belgium, was established in the eighth century, and still continues to receive patients, most of whom are quiet or chronic cases, who find homes among the surrounding peasantry. In the twelfth century there is said to have been an asylum at Bagdad. The Bethlem Hospital, of London, first received the insane at the close of the fourteenth century. After this period asylums were opened in France, Ger-

many, and Holland. There was, however, little improvement in the care or the treatment of the insane in Europe down to the time of Pinel, in 1792. By the efforts and indomitable will of one man, the condition of the insane upon the Continent was greatly ameliorated; and the law of humanity and kindness received its first practical illustration there, when Pinel, in the Bicêtre, one of the large asylums of Paris, released from their chains and brought into light and liberty fifty of the insane who had long been confined in a worse than penal imprisonment.

In England, in 1794, the spirit of reform, instigated by the abuses of the asylum at York, induced the Friends to establish an institution of their own, the York Retreat, which, from the date of its origin, has been noted for the humane and enlightened principles of its management. It was not, however, till some twenty years later, in 1815, that the investigation into the affairs of the Bethlem Hospital by a Parliamentary committee aroused the attention of the people generally to the fearful condition and brutal treatment of the unfortunate lunatics, and brought about a series of changes which introduced the reign of humanity in the care of the insane in England. Progress thus begun, has, by successive steps, guided by the advance in medical science, raised the asylums of that country and of Europe to the position they now hold.

In America, in 1750, or forty-three years before the movement of Pinel, the Pennsylvania Hospital at Philadelphia was organized, and a department for the care and treatment of the insane was established, in which the system afterwards advocated by Pinel was anticipated, and the barbarous methods of treatment to which the insane were then exposed were abandoned. The act, as passed by the Provincial Assembly, provided "a hospital for the reception and relief of lunatics and other distempered and sick poor without partiality or preference." This institution, the first projected on this side of the Atlantic, still exists as the insane department of the Pennsylvania Hospital, and during the whole period it has retained its position of prominence, and carried out the principles upon which it was founded. In 1773, the Eastern Lunatic Asylum, located at Williamsburg, Virginia, was organized by legislative appropriation, and is therefore the oldest State Asylum in the United States. In 1797, the insane department of the New York Hospital, now known as the Bloomingdale Asylum, was opened for patients. During the same year the Maryland Hospital, at Baltimore, received a limited number of patients. This completes the list of asylums established in this country before the beginning of the present century.

Institutions for the insane have been organized in nearly all

the States, and in some of the Territories of the United States. They now number one hundred. Of these seventy-one are State Institutions ; ten are incorporated charitable institutions ; ten are city or county institutions, having a resident medical superintendent, and nine are private institutions. The latter have under care about two hundred and fifty patients. The total accommodations provided in organized institutions in this country are for about 36,000 patients. For the remainder, about 9,000, no adequate provision has been made.

In the hospitals erected at the present time the intention and aim are to provide whatever can promote the recovery and the comfort of the inmates. The buildings are divided into wards, consisting of long halls or corridors, with rooms on the side. The wards are entirely separate, each having its own sitting, dining, and service rooms, thus practically making an asylum an aggregation of several communities, living under the same roof. This secures a classification, based on the power of self-control and upon the varying mental and physical condition of the patients, and promotes order and discipline.

The best institutions, as now organized, are placed under the charge of a Board of Trustees, or Managers, who are responsible to the executive and legislative authorities of the State. The immediate control is vested in a Superintendent, or chief medical officer, who appoints his subordinate officers, subject to the approval of the managers. Attendants are employed for their fitness and ability to perform the delicate and arduous duties of their position. In all their intercourse with the insane, kind and humane treatment and attention to the wants of patients are enforced by stringent printed rules and regulations, and by the constant and continuous supervision of the medical officers. This supervision extends to everything relating to the well-being and comfort of the insane—to the entire treatment which is divided into medical and moral. The former includes the hygienic and sanitary surroundings, the diet, and the administration of remedies ; the latter includes the exercise, occupation, amusements, recreation, and discipline, or the influence of mind over mind, which the sane exert over the insane, and the insane over each other.

The special advantages of treatment in an asylum are : Removal from home and from the irritations of life there, with complete change of scene and of associations, which is often an important and necessary step in promoting recovery. It gives the patient the benefit of the skill and experience of those accustomed to care for the insane. It secures the advantages of moral treatment,

directed to the wants of each individual case, and also of an institution constructed and arranged with special reference to his varying needs. It allows of more freedom than can be permitted elsewhere, especially in acute cases, and prevents the seclusion which is a necessity at home, and is usually only injurious. It protects the patient from injury to himself or others, and secures quiet, rest, and regularity of life. In the presentation of these advantages it largely enhances the prospect of recovery.

Respecting the character of asylums, and the treatment of patients therein, the knowledge of the people generally is quite limited. Opinions are derived, for the most part, from sources that are not trustworthy or entitled to belief. They are formed largely upon the sensational reports of newspaper writers, or of novelists who sacrifice the truth to the plot of a story, or of patients who have been discharged uncured, and who delight to entertain the listener with marvellous accounts of their personal experience, and who misinterpret facts, or color them with the tint of their own delusive ideas.

The strict seclusion of the insane, and the exclusion of visitors from asylums which has done so much to create suspicion and arouse prejudice, no longer exist. The personal visitation and inspection which are now generally permitted are calculated to inspire confidence in their management, and to prove the advantages to be derived from care and treatment in hospitals for the insane. The quiet, neatness, system, and freedom from personal restraint characteristic of every well-conducted asylum, are in striking contrast with the preconceived ideas of those who look for cells and chains, and expect to hear the noise and confusion of a veritable bedlam.

Asylums of the present day are hospitals for the cure and care of the sick; they are homes for the helpless and the incurable, who there receive skilled, considerate, and thoughtful care, which friends are often either unable or neglect to give them. They are not, as is sometimes thought and even asserted, places where sane people can be incarcerated by designing and interested persons. That some who are not insane are at times committed to them, simply shows the imperfection of human judgment, but does not reflect upon the intentions of those who commit them. A large number of those discharged as not insane, by officers of asylums, are sent thither after due examination, upon the order of a court or public official. Others, again, are cases of intemperance or vicious indulgence, in which the conduct of the individuals very naturally gives rise to the suspicion of insanity. Still another class of the not insane, are cases of delirium, or hysteria, which simulate in-

sanity so closely as to deceive both the friends and medical practitioner.

The law of commitment of the insane to asylums in most of the States creates a sufficient barrier against the improper confinement of the citizen. In some of the States a trial by jury is required before a person can be sent to an asylum—an expensive and often injurious proceeding. In most of the States an examination, under oath, by one or more, generally by two physicians, is required. In the State of New York the approval of a court to the medical certificates must be obtained before the commitment is legally made.

Special attention was given to this subject, in this State, for some years, and in 1874 all the statutes relating to insanity were revised and codified. The provisions for the commitment of the insane, and for the visitation and supervision of institutions for their care, are as well guarded, efficient, and thorough as those of Great Britain, from whose statutes the various States have so largely copied in framing their laws.

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The Mouth and Teeth.

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THE MOUTH AND TEETH.

THE mouth, properly speaking, comprises the greatest variety of separate organs of any portion of the body. Bones, teeth, muscles, mucous membrane, glands, nerves of common and special sensibility and of motor function, and blood-vessels, all enter into its construction. Its cavity serves not only as the receptacle for food undergoing mastication, but it also aids in the production of the voice, and, when the nasal passages are insufficient to allow the entrance and exit of the air needed in respiration, the opened mouth very greatly increases the available amount of air-supply. In infancy the movements of the tongue create a vacuum which draws milk from the breast, while in later years it serves to place the food so as to be best acted upon by the teeth, and in the playing of musical instruments it modulates the current of air and aids the lips in producing the vibrations in the current which cause musical tones.

The bones which form its framework are rather appendages than integral portions of the case which holds the brain and which forms the great bulk of the skull, and they are peculiarly adapted not only to hold the teeth, but they also serve to protect the large blood-vessels which go to the brain, and to give prominence and expression to the lower part of the face. The teeth, which are firmly planted in bony sockets, are not only capable of seizing, cutting and grinding the articles used as food, but they also modify the voice in a very considerable degree. The upper jaw, being firmly attached to the under side of the skull, is immovable, but the lower jaw is so hinged that it moves quite freely in all directions. Several sets of muscles are provided which open the mouth and change its form, while others, which are among the most powerful, close the lower jaw and move it from side to side.

Owing to peculiarities in their mode of development and to their complex character, the bones and other organs of the mouth are liable to a great variety of malformations and diseases, some

of which are extremely painful or disfiguring in character. Some of these affections are unavoidable by any means yet known, while others by prudent forethought can be avoided, and their effects, with proper management, can be more or less relieved.

The offices of the mouth are, the reception of food, taste, mastication, insalivation, and articulation, and it possesses organs for the fulfilment of these purposes. It is the beginning of the alimentary canal. Looking into the mouth we observe that it is an ovoid cavity, bounded behind by a veil or curtain (the soft palate). This falls obliquely downward and backward, having a central pendulous organ called the uvula, terminating laterally in arched curves. [See Fig. 115, p. 378.] Every part of the cavity is covered by a mucous membrane, which membrane we find associated externally on the lips with the common skin ; internally, we see it passing back of the soft palate down the throat. This mucous membrane, with some variation in its structure, lines the entire alimentary canal, as well as the air-passages.

The Upper Jaw.

The superior maxillary bone is one of the most important bones of the face. With its fellow of the opposite side, it constitutes the entire upper jaw. It is the largest bone of the face except the lower jaw. Each bone assists in the formation of three cavities: the roof of the mouth, the floor and outer wall of the nose, and the floor of the orbit. The superior teeth are inserted into it. The body of the bone is hollowed out in its interior, and forms a large cavity—the antrum of Highmore. This cavity is particularly interesting from the fact that it is so often the seat of an abscess, produced by the death of the molar teeth, whose roots frequently either penetrate its floor, or are in such close proximity that an abscess produced by them will readily open into it.

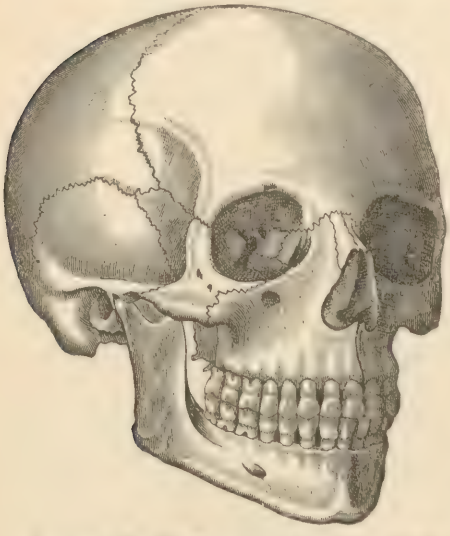


FIGURE 153.—Skull, showing the bones of the upper and lower jaws, and the teeth.

The Lower Jaw.

The inferior maxillary bone is the largest and strongest bone of the face. It consists of a body, of horseshoe shape, and two branches joined to the body at nearly right angles. The branches, curved and angular at the base, terminate above in two processes: the *condyloid*, for articulation with the glenoid cavity of the temporal bone, and the *coronoid*, for the attachment of the large muscle of the temple which serves, with others, to close the jaw.

The relation of the perpendicular to the horizontal portion of the bone varies in different ages. In early infancy the angle is very obtuse; in fact the two portions are nearly on the same plane. In adult life a nearly right angle is acquired. As the teeth are lost, in old age, it again becomes obtuse. This accounts for the peculiar prominence of the lower jaw in old and toothless persons.

The Teeth.

The teeth, in the adult, are thirty-two in number, sixteen in each jaw, as follows: two central, and two lateral incisors, two

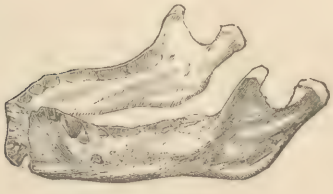


FIG. 154.

FIG. 155.

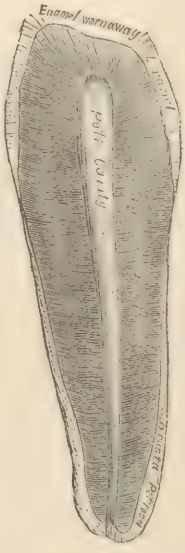


FIG. 156.

FIGURE 154.—The lower jaw of an infant.
FIGURE 155.—Section of an incisor tooth, magnified, showing the pulp-cavity and the relation of the dentine and enamel.
FIGURE 156.—Section through a molar tooth; natural size.

canines, four bicuspids, and six molars. They consist of three portions: a crown, which projects out of the gum, a neck to which

the gum is attached, and a root, or roots, which set in the sockets formed in the alveolar processes of the jaw-bones. All the incisors and canines, both upper and lower, the second bicuspids in the upper, and all the bicuspids in the lower jaw, have but one root each. The first bicuspid in the upper, and the first and second molars of the lower jaw have each two roots. The first and second molars of the upper jaw have three roots each. The third molars, or wisdom teeth, both upper and lower, vary in their number of roots from one to four, and sometimes they have even as many as five or six each.

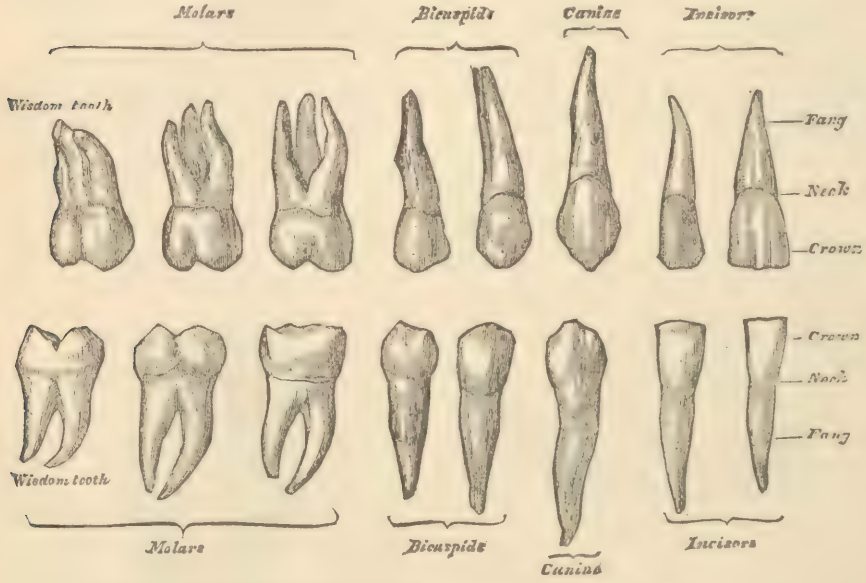


FIGURE 157.—Permanent teeth of the upper and lower jaws on the right side.

Teeth are composed of three distinct structures: the *enamel* which covers the crown, and terminates at the neck; the *cementum*, which covers the roots, joining the enamel at the neck; and the *dentine*, which forms the body of the tooth, in the centre of which the pulp is located, which is in shape very nearly the same as the tooth, and occupies in the crown about one-third of its diameter.

The *enamel* is composed of about three parts in a hundred of organic material, which, besides forming a matrix, or frame-work, for the retention of the inorganic portion in position, consists, in part (very minutely of course), of living matter. The inorganic matter (ninety-seven parts in a hundred) is composed principally of phosphate of lime, with traces of fluerate of lime, carbonate

of lime, phosphate of magnesium, and other salts, rendering this portion of the tooth the hardest substance in the body.

The *dentine* is composed of about twenty-eight parts, in a hundred of organic matter, and seventy-two of inorganic. The organic, as in the enamel, forms the matrix, into which the lime-salts are deposited, besides being composed in a greater degree, of lining matter.

The *cementum* is composed of about thirty-three parts of organic, and sixty-seven of inorganic material; and here the same condition of things exists as in the enamel and dentine: the organic portion forming the matrix for the deposition of the lime-salts, and sheaths for the protection of the living matter.

At the junction of the enamel and cementum with the dentine, a more liberal distribution of the living matter takes place than is found in any other portion of the tooth structure, which accounts for the excessive sensitiveness experienced when they are cut in this locality.

The *pulp* which occupies the central cavity in each tooth, is composed of capillary blood-vessels and filaments of nerve in great abundance, held together and in position by connective tissue. From this pulp the entire tooth is nourished and furnished with sensation, except the cementum, which receives its nourishment from the periosteum which lines the sockets in which they stand, and which is firmly attached to the roots.

The teeth, thirty-two in number in the adult, are placed in articulating arches or curves upon either side, and are in shape and character midway between those characteristic of flesh-eating (or *carnivorous*), and vegetable eating (or *herbivorous*) animals. Certain of their number, the incisors, are so shaped and arranged as to cut, or incise; the canines to tear, or more firmly hold upon substances; the bicuspids and molars to comminute or grind.

The teeth are intended to serve no less than four distinct purposes, viz., cutting or incising, masticating, to assist in the articulation of words, and to give a proper expression or contour to the mouth and face. The part they perform in the process of digestion is of incalculable importance to the health and comfort of every individual. The loss of teeth, particularly in front of the mouth, is detected in the pronunciation of many words, a sudden loss of them often rendering the person incapable of speaking sufficiently distinct to be understood, and the changes in the expression of the mouth and face are so marked, that friends often fail to recognize.

The roof of the cavity is a thin, bony wall between it and the cavity of the nose, and is covered by mucous membrane.

If we continue to look into the mouth for a short period, we will observe that a fluid resembling water frequently flows up from beneath the tongue just behind the incisor teeth. Also, by observing the inside of the cheek, we will see the same fluid flowing from a small orifice opposite the second molar tooth of the upper jaw. This fluid is *saliva*, and comes from glands situated in their respective neighborhoods. The mucous membrane of the roof of the mouth, after it has been kept open a short time, is frequently seen to be covered by little drops. This is *mucus*, and is the product of the follicles or glands of the common membrane.

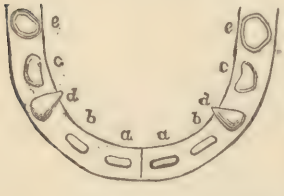
The Tonsils are glandular organs, situated on either side of the opening from the cavity of the mouth into the pharynx. These bodies are almond-shaped in form, with many fissures lined by the common mucous membrane. They are quite frequently the seat of such chronic overgrowth as to necessitate their removal. In the fissures, particles of food are liable to lodge and become the source of foul breath.

The Tongue is a complex structure, although it is made up principally of muscular tissue. It is attached to the inferior maxillary bone in front, and to the hyoid bone behind, and moves with the greatest facility in any direction.

The tongue, a muscular body, rests within the lower dental arch. It evidently is fitted and suited to preside over the labor of the teeth; it receives or rejects articles to be masticated; places and retains such articles in position for that purpose, and, when they are ready to be swallowed, rolls them up into a bolus and passes them into the pharynx.

First Dentition.

The first or temporary set of teeth consists of twenty in number, ten in each jaw, as follows: two central, and two lateral incisors, two canines, two first or small molars, and two second or large molars. They come into the mouth, or are *cut*, in the following order and age of the child:



1st.	The	lower central incisors	(*a*)—	5th to 7th month.
2d.	"	upper central "	—	6th to 9th "
3d.	"	lower lateral "	(*b*)—	7th to 10th "
4th.	"	upper lateral "	—	8th to 11th "
5th.	"	first or small molars	(*c*)—	11th to 17th "
6th.	"	canines	(*d*)—	13th to 20th "
7th.	"	second or large molars	(*e*)—	20th to 30th "

It will be observed from the above table. that at the tender age

of five months, trouble with the teeth begins, which in too many instances never ceases, until they have all come and gone.

The period of dentition is undoubtedly the most critical in the existence of children. It is during this period that the parents are in great anxiety concerning them, and the physician is often called in to examine the child's mouth, to see if lancing the gums will not, in his judgment, afford some relief—an operation which should seldom be resorted to. When the case apparently demands such an operation, however, great care should be taken that the tooth or teeth are sufficiently advanced to readily make their way through the opening made by the lance before the gum heals over the cut. If it be done too early, a cicatrix forms, which is much harder for the tooth to penetrate than the gum would have been in its normal state. In lancing the gum over the front teeth, the cut should be made on a line with the edge of the tooth, over the back or molar teeth; a simple cut over the prominent point will generally afford the relief desired. In every instance the lance should penetrate deep enough to strike the tooth unmistakably, otherwise it will not relieve the child, but will heal over, thus increasing the difficulty and distress of the little one.

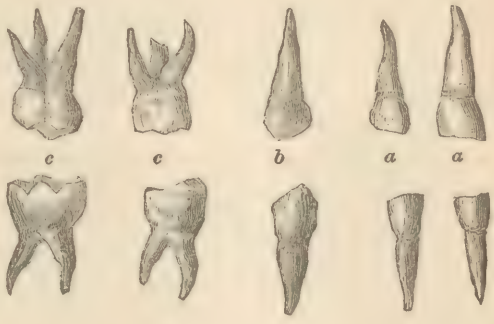


FIGURE 158.—Primary or milk-teeth of the right side of the upper and lower jaws: *a*, the incisors; *b*, the canines; *c*, the molar teeth.

In the great majority of cases, as soon as the teeth are all in place (cut), the services of a good dental-surgeon should be called into requisition. The molars often being imperfectly formed, immediately begin to decay, and should be filled before the decay progresses far enough to render the operation of filling painful. The dentist should be seen at least as frequently as once in every six months thereafter. By so doing, a great amount of pain for the child is avoided, and the teeth are kept in the mouth until it is time for them to be removed. The child is also taught to take proper care of the teeth, the benefits of which cannot be too highly estimated.

The materials best adapted to the proper filling of children's teeth, are amalgam and the preparations of gutta percha, on account of the ease and rapidity with which they can be placed into the

teeth. In most cases, gold or tin-foil requires too much force and too long a time to adapt them to the walls of the cavities perfect enough to prevent the tooth from further decay. A child should never sit in a dentist's chair until it becomes fatigued; one-half to one hour being as long as they should be subjected to it.

During the period from two and a half to six years of age, there is a marked change taking place in the front of the mouth. The teeth, which at the former age stood close to, and touching each other, have gradually separated, so that at the latter age they are frequently a sixteenth of an inch apart, and the jaws are nearly one-third larger than formerly. This change is due to the development of the permanent teeth in the jaws, and is indicative of *regularity* of the permanent teeth when they come into the mouth. On the other hand, should it be observed that this separation does not take place, it is almost a sure indication that the permanent teeth will come in very irregularly.

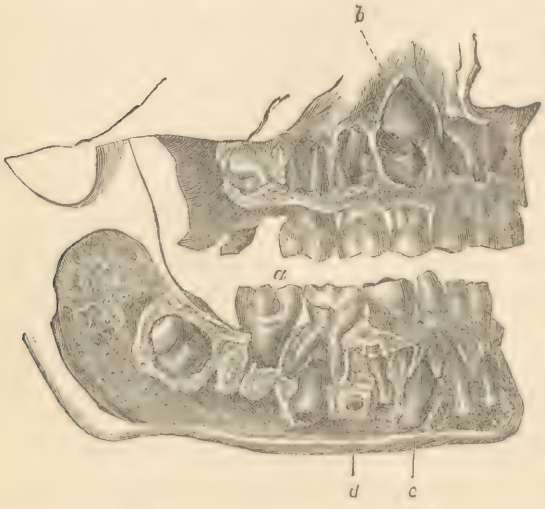


FIGURE 159.—Set of milk teeth with the corresponding permanent teeth still embedded within the jaw. The first permanent molars (*a*) have already emerged from the jaw both above and below, so that the second dentition has commenced. The somewhat inclined crowns of both permanent incisors are to be seen behind the roots of the milk incisors. The crown of the upper canine tooth (*b*), is quite sloping and is situated high up in its socket. The crowns of the permanent bicuspids are grasped by the roots of the milk molars. The crowns of the second permanent molars are still embedded in the jaws.

At the age of about six years, there is also a change taking place in the back of the mouth. The jaws have now grown sufficiently in that direction to accommodate another tooth on either side, which now present themselves behind the temporary molars; they are the first, or *sixth year molars* of the permanent set. These teeth are often considered by parents as those of the first or temporary teeth, inasmuch as none of the first teeth have been taken out. Consequently, they are often neglected until hopelessly decayed. They are usually imperfect upon their grinding surfaces, thus forming lodgment for decomposing food, etc., and are consequently subject to early and rapid destruction by decay. They should be carefully examined as soon as they are through the

gums, and the slightest imperfections immediately filled. These are the largest and most powerful of the permanent teeth, and presenting as they do the greatest amount of chewing surface, it is very important that they should, in most cases, be permanently preserved. I say in most cases—occasionally a case presents itself where, by their removal at the age of from ten to twelve years, actual deformity of the face may be avoided; on account of the excessive size of all the permanent teeth, unless some of them be removed, the lower part of the face grows out of proportion to the upper. Again, these teeth may have become so badly decayed before any attention has been paid to them, that any effort to permanently keep them in the mouth would result in failure; in such case it would be best to have them removed. Under all circumstances, when thought advisable, from any cause, to remove one of them, have its fellow on the opposite side removed also. Should this not be done (as is too often the case), quite a marked deformity of the face will be the result. As a rule, it is always the safest plan to have the entire four extracted, if any.

Shedding of Temporary Teeth.

At this period, from the sixth to the seventh year, the shedding of the temporary teeth begins. Inasmuch as second dentition depends, in a great measure, for its proper accomplishment, upon the time at which the temporary teeth are removed from the mouth, I propose to give the proper time for such removal, and allow the permanent teeth in coming in, to take care of themselves, or rather let Nature take care of them. This I consider of much more importance than a discussion of second dentition proper.

As in coming in, each tooth or pair of teeth (for they usually come in pairs, and should be removed in the same manner) of the temporary set has its time at which it should be removed from the mouth, in order that it shall not remain as an obstruction to the progress of the permanent tooth, which is to take its place, and which will almost immediately present itself through the gum. The time for their removal is usually indicated by their becoming loose; the loosening is occasioned by the absorption of their roots, which is caused by the growth and progress of the permanent tooth beneath. See Fig. 159.

The first to become loose and require extraction, are the central incisors of the lower jaw, which occurs between the sixth and seventh year. From six months to a year later, or between the seventh and eighth year, the central incisors of the upper jaw will become loose and should be removed. A few months later

(during the eighth year) the four lateral incisors, two upper and two lower (the lower preceding the upper), present the same conditions and should be taken out.

At this period the mouth often presents a very interesting, and sometimes, to parents, an alarming condition. The four permanent incisors are so much larger, and occupy so much more space than the temporary ones which have been removed, that they are frequently very much crowded and irregular, so much so that the anxiety on the part of the parents becomes very great for fear of permanent irregularity, and the little one is taken to the dentist for the purpose of consulting him in reference to the advisability of removing the temporary canines in order to give room for the incisors to become regular. Of course the dentist advises that they should not be removed. Should he do otherwise, and take them out, the immediate result would undoubtedly be pleasing, but eventually the effect would be very unpleasant indeed, as it would produce a most unsightly irregularity. The root of the temporary canine having been so little absorbed, the permanent tooth being still so deep in the jaw, and requiring so long a time for its development and growth into its proper place, the permanent incisors, in regulating themselves, readily occupy the places of the temporary canine, if they have been removed. Should they not succeed entirely in doing so, the molars become pushed forward by the growth of the permanent molars behind, and thus, in the course of a year or two, no place whatever is left for the permanent canine tooth, and it presents itself some years later than it ought, usually in front and entirely outside the line of the other teeth. Such teeth are then called "tusks," and, in too many instances, these most valuable teeth are sacrificed through the ignorance of the parents and attending dentist.

The temporary canines should never be extracted to make room for the permanent incisors. Should the incisors come in irregularly, the effort of nature to regulate them will often result in the growth of the jaw and alveolar process, sufficiently to accomplish the desired end.

There is usually a lapse of about two years after the removal of the lateral incisors before any other of the temporary teeth should require removal. We then (about the tenth year) find the first molars loosening, and they should be removed; in their places will come the first bicuspids of the permanent set. About a year later (or the eleventh year) the canines will require removal, and the permanent teeth will soon make their appearance. These teeth are considerably larger than the temporary ones, and will, of course, require more room, which nature has provided in the case of the

second molars, which will require removal about the twelfth year, and which occupy much more room than is required for the second bicuspids which take their places. By a process which Nature usually takes care of, the first bicuspid is pushed back by the canine, which in turn falls into its proper place.

RECAPITULATION.

1st.	Lower central	incisors	should be	extracted	between the	6th and 7th years.
2d.	Upper "	"	"	"	about "	7th year.
3d.	Four lateral	"	"	"	" "	8th "
4th.	First molars		"	"	" "	10th "
5th.	Canines		"	"	" "	11th "
6th.	Second molars		"	"	" "	12th "

At about the latter period (at twelve years of age), the second permanent molar presents itself through the gum, and from eighteen to thirty the generally unwelcome

Wisdom Teeth

make their appearance. Sometimes, however, these teeth come into the mouth much later in life. I have a patient who cut the two upper wisdom teeth after the age of sixty years. It is not an unusual thing for people to suffer very severe and protracted pains during the cutting, or rather on account of these teeth, particularly those of the lower jaw. There is frequently so little room between the second molar and the angle of the jaw, that, in their endeavor to take their proper places, they are tipped forward, and the crown is forced against the root of the second molar; its progress is then stopped, and an irritation is set up which often for months, perhaps for years, is the seat of most excruciating neuralgic pains, over the face, head, neck, and shoulder, causing, perhaps, deafness upon the affected side, loss of sight, etc., etc. Eventually, unless relief is obtained, an abscess will form, which will probably relieve the acute diffusive neuralgic pains, which then become localized in the neighborhood of the angle of the jaw. As pus begins to accumulate, the neck and face swell, sometimes out of recognizable shape. Should the abscess "point" into the pharynx, the patient's life may be in great danger; it is then that prompt action is necessary to prevent the patient from choking to death before the swelling is stopped by the discharge of the accumulated pus.

When the dangerous position of these teeth above described is recognized, either by patient or dentist, undoubtedly the best treatment would be their immediate removal. It is, however, very often that they come in without very much trouble, except, that

from the relation of surrounding parts, a portion of their crowns are sometimes kept for months under a flap of gum, which holds more or less decomposing food directly in contact with them, often resulting in quite extensive decay before the whole grinding surface is visible.

DISEASES OF THE TEETH.

Decay or Caries of the Teeth.

Caries and *tartar* are said to be the two grand agents that give business to the dentists. At the head of these is caries, the most common and formidable disease to which these organs are subject. Until within the past two years this disease was very little understood. Every writer upon the teeth from the time of John Hunter, of England, had, however, a theory as to its causes and progress, some claiming that it is altogether chemical in its operations, others that it is an inflammatory process, and others still, that it is produced and carried on by vegetable organisms, which are found in great numbers in the mouth, particularly where food is allowed to remain around and between the teeth until it undergoes decomposition. These organisms are also found in decayed cavities in the teeth in great quantities. That they play any important part in the origin or progress of the decay of teeth, however, is considered very improbable by educated dentists.

After much labor and study with the microscope, it has pretty clearly been settled that caries first begins by the action of an acid, which, in a chemical way, dissolves out the lime-salts from the enamel. It would be quite natural to suppose that it would require a strong acid for the decalcification of so solid a tissue as the enamel of a tooth, and the question often arises, where does this acid come from? First let us consider the starting-points of the morbid process. It is a fact that caries never begins upon the smooth surfaces of teeth which are exposed to the friction of mastication, but it always starts at points which, owing to their anatomical structure, form receptacles for food, etc., or between the teeth where, owing to want of cleanliness, decaying material can accumulate. The friction produced by the teeth coming in contact with each other does not produce caries, but it is to the acid generated from the decaying material retained between the two flat or concave surfaces which the teeth present to each other that the beginning of the destruction of the enamel is due. That this decaying material is food will hardly admit of a doubt: and in such kinds of food as, through their decomposition, produce an

acid, not very strong it is true, but which possesses a high degree of affinity for lime-salts, viz., lactic acid.

First among the varieties of food ranks meat, which, by putrefaction, may produce free lactic acid; next are the saccharine materials; and last the amylaceous, which, being converted into glucose by the action of the saliva, may be transformed, if brought in contact with putrefying meat, into lactic acid. There is no doubt that the organic portion of teeth, as it advances to the stage of decomposition in the process of caries, plays a very important part in the formation of this acid.

As soon as the lime-salts are dissolved out sufficiently to expose the living matter of the tooth, an inflammatory reaction takes place, which, in acute caries, penetrates the substance of the tooth to a considerable extent, producing a melting down of the organic portion (matrix), which then returns to its original or medullary condition.

It is well known that the teeth of some persons decay much more rapidly than others; this is due to the fact that they contain less lime-salts and more of organic material. Why this should be so is a question not easy to answer. We are told that such people inherited poor teeth from their parents; then the question arises, why did the parents have such teeth? Many teeth come into the mouth in an imperfect state; more particularly is this the case with the molars and bicuspids, which predisposes them to decay; consequently they should always be examined as soon as they are through the gums, and the smallest possible imperfection thoroughly cleansed and filled. Imperfections of the enamel, occasioned by a severe and protracted illness of a child (such as scarlet fever, measles, etc.) during the development of the teeth, are quite frequently seen. In such cases the surfaces of the teeth should be made as smooth as possible by a dentist, and kept scrupulously clean to prevent them from decay.

There are certain physiological conditions which seem to predispose teeth to decay, such as pregnancy, when there is an excessively strong acidity of the fluids (not the saliva in its pure state) of the mouth, which acid readily acts upon the teeth. It is a very common experience with mothers to "lose a tooth with each child." During this period the teeth should be examined often, and any carious places found should be filled *temporarily* with gutta-percha.* As a preventive against caries at such times —or, in fact, at any time—it is well to rinse the mouth several

* Severe operations upon the teeth during pregnancy are not only excessively painful, but are attended with more or less danger, both to mother and child.

times a day with a strong solution of bicarbonate of soda in water. This should always be done after taking any acid medicines, and also when the teeth are very sensitive, as it will, in a few days, render them almost painless to dental operations.

Caries, when slight, will often produce toothache, and sometimes severe facial neuralgia; more particularly is this the case when the decay is located at the necks of the teeth, and during pregnancy. Such pains, however, are more frequently caused by an irritated or inflamed pulp due to caries having penetrated the substance of the tooth until it has become exposed, or to periostitis (inflammation of the periosteum surrounding the roots of the tooth), a condition liable to occur with any tooth, the pulp of which has been destroyed. By neutralizing the acid (which is always present in the cavities of decay) by rinsing the mouth every three or four hours with a solution of bicarbonate of soda in water (two teaspoonfuls of the soda to a glass of water), the pain arising from teeth when the pulps are not exposed will, in most cases, be readily allayed. When the pain is produced by an irritation of an exposed pulp, an application of oil of cloves, laudanum, ether, or chloroform, on a small pellet of cotton, and covered over with a pellet of cotton dipped into a solution of gum mastich, or Canada balsam, in chloroform, will often quiet the pain temporarily. Creasote should never be used, except by a professional man, on account of the danger of doing severe injury to the surrounding parts. For further treatment the dentist should be consulted.

Gum-boil—Alveolar Abscess.

This is a very common disease, liable to occur in the mouth of any person; it is always caused by the decomposition in a tooth of a dead pulp, either entire, or of portions left, which, from the tortuousness or narrowness of the canals, it has been impossible to remove, or similar decomposition of the organic portion of the tooth structure, when the gases from it are allowed to exude into the pulp canal which has been imperfectly filled.

Symptoms.—The first symptoms of an alveolar abscess are soreness of a tooth on closing the jaws, or to the touch. This soreness continues some ten or twelve hours before actual pain begins. If allowed to take its own course, the pain will continue for four or five days, increasing in intensity each day and hour, when it will gradually subside, and the face then begins to swell. The matter is commonly discharged through an opening, which occurs just outside the tooth in the gum at the point where the swelling of the gum has been greatest. There afterward continues to be an

opening at this point, unless the amount of matter discharged is small, when it closes for a time. In this case, a little pouting, nipple-shaped growth forms in most cases, as the matter accumulates; the tooth again becomes sensitive, the little nipple ruptures, and another escape of matter takes place, and so on indefinitely, until properly treated.

Treatment.—During the period of swelling of the face, the common and very bad practice is to poultice it. While this may possibly allay the pain in a measure, it, at the same time, occasions the destruction of an unnecessary amount of tissue, besides tending to bring the pus to the surface, where it will discharge, leaving, when cured, an unsightly scar and depression upon the face. The only treatment, after the swelling begins, that can be recommended before consulting a dentist, is the application to the face of ice, or iced-water. Professional treatment is always necessary as soon as the first soreness of the tooth is observed.

Tartar, or Salivary Calculus.

The fluid (saliva) which is almost constantly poured into the mouth during the daytime, or wakeful hours, is, as before explained, the product of various glands. It holds in solution inorganic or earthy matter (carbonate of lime), in varying quantities in different persons, which is liable, when thorough cleanliness of the teeth is not observed, to deposit upon them. During the process of deposition, mucus and particles of food are lodged in the interstices, making it a concrete substance, from which fact the name tartar is given to it. The quantity of tartar deposited, as stated above, varies in different persons, as do also its chemical and physical characteristics. It is sometimes composed almost entirely of inorganic material (when it deposits very rapidly); sometimes the organic matter will be found to predominate. It is frequently found extremely hard, then again so soft that it may readily be removed with an ordinary toothpick. The various colors of tartar to be found in the mouth, are yellowish-white, light brown, dark brown, black and green. That which deposits the most readily, in the greatest quantities, and is the least injurious to the surrounding tissues, is the lightest in color. This is usually found on the lower front teeth, and on the upper molars, opposite the openings of the salivary ducts. It seldom lodges under the gum, but is attached to the enamel upon the crowns of the teeth, sometimes covering them almost entirely. The dark brown and black deposits occur much more slowly and densely, but more universally, as all the teeth, both upper and lower, are liable to its visitation.

It is usually found under the edges of the gum, firmly attached to the necks of the teeth, and presenting to the gum a rough surface which produces congestion, swelling, sponginess, and ulceration of this tissue, and absorption of the alveola. Unless interfered with, the accumulation increases, and the process of absorption goes on until the entire sockets of the teeth are destroyed, and they fall out, or are picked out by the patient. I presume that, after the age of thirty years, more teeth are lost from this cause than from all others combined.

Aside from the danger of losing the teeth, there are other disagreeable features which accompany this condition, such as a bad breath, soreness of the teeth in masticating, neuralgic pains through the face and head, and, often, impairment of the sight and hearing. If taken in season this can all be easily prevented. No amount of care one may bestow upon their own teeth, however, will prevent this accumulation altogether, or remove it after it has accumulated. It is a condition which requires, and must have, the best of professional attention.

The green tartar or, perhaps more properly called, "stain," is usually found upon the outer surfaces of the upper front teeth, more frequently of young persons. Unlike all other forms of tartar, it is of an acid nature, and usually produces caries of the teeth. Its presence is, in all cases, attributable to a want of proper cleanliness on the part of the patient, for when the teeth are kept clean by brushing, the green tartar or stain is never to be found. When once deposited, however, the services of a dentist should be sought at once, and its removal, and a most perfect polishing of the enamel, should be accomplished.

Artificial Teeth.

It is, unfortunately, a fact that notwithstanding the universally acknowledged skill of American dentists in preserving natural teeth, and the knowledge of the community in general, in the matter of proper care of, and attention to these organs, many people are obliged to submit to the disagreeable necessity of wearing artificial substitutes. The practice is altogether too common, among many dentists, to remove from two to six, perhaps eight or ten good teeth, which, with comparatively little trouble and expense, might be kept and made to do good service for years, and to replace them with an artificial set, which possibly may look better than the old ones, but, for service, are a very poor substitute indeed. Very few plates, either partial or entire, are worn with absolute comfort. They are either loose and in danger of

falling, or rest against other teeth for support, which they soon render sensitive and cause to decay. Should the wearer experience no real pain, there is a constant fear of some accident, such as the teeth coming off at most inopportune times, when in company, at dinner, for instance, or the plates being thrown from the mouth when coughing, sneezing, or when seasick, and so forth.

Recognizing the fact, however, that the necessity exists for the wearing of plates of some kind, the questions most people are interested in, more than any others, are, what are the best materials, and how should they be fitted to and worn in the mouth to insure the greatest amount of comfort to the wearer ?

For full sets, either upper or lower, the best materials are gold, platinum (continuous gum), or porcelain, for the reason that they contain no poisonous ingredients, and are good conductors of heat and cold. The mucous membrane covered by the plate is kept in a much more healthy condition than it is under rubber or celluloid, each of which contains more or less poison (red oxide of mercury) ; and they are both non-conductors of heat and cold, consequently the mucous membrane covered by them is kept at a high degree of temperature constantly, which often results in a very severe congestion of the parts, which may, and often does, extend to the throat and air-passages. It has recently been ascertained, that through this constant irritation produced by wearing these plates, the hearing is often very seriously affected, and I have no doubt that the eyes may suffer just as much, although this particular branch of the subject has not been carefully investigated as yet.

Partial plates are, if anything, more distressing to the wearer than even entire dentures. The habit of too many dentists is, in putting a few teeth in the front of the mouth, for example, to carry the plate back on either side, to the extreme back molars, and for its support it is braced against each tooth, covering one-half or two-thirds of their inner surfaces, thus holding decomposing food constantly against them. This sooner or later produces an irritation and absorption of the gums, exposing the necks of the teeth, which soon decay and become extremely painful and annoying, besides forming an opening for the lodgment of tartar which, if allowed to go on, soon loosens the teeth, and eventually makes them sore to bite upon, and finally they are lost altogether.

For partial plates, the best material, and the most comfortable to wear, is undoubtedly gold or iridio-platinum, for, with either of these, much less room is taken up in the mouth than with any other material. They are good conductors of heat and cold, and can be so adjusted as to be held in place, either by atmospheric pressure, or by clasping to two or three teeth. If by the former,

they should stand away from the insides of the teeth, at least three-sixteenths of an inch ; if by the latter, the plate should stand the same distance away from all teeth, except those clasped. With care (taking them out, and thoroughly cleaning them two or three times a day, and at the same time carefully cleansing the teeth clasped), such partial plates may be worn with comparative comfort, and with very little or no injury to the other teeth for many years.

All plates should be removed from the mouth at night, so that any irritation produced by them may, in a measure, be allayed. No person should ever go to sleep with a partial plate in the mouth, as there is great danger of its becoming dislodged, and carried into the throat.

Individual Care of the Teeth.

The proper care of the teeth is a subject very little understood by people in general, although it is claimed by those who pretend to take any care of them at all, that they follow the directions of their "professional adviser," notwithstanding nearly all they do is in the wrong direction.

As soon as a child cuts its first teeth the cleansing process should begin by rubbing them with a bit of linen, and, as soon as it is old enough to allow a brush in the mouth, it should be used at least twice a day. This should be kept up through its after-life. The proper time for brushing the teeth is in the morning after breakfast, and before retiring at night. A very narrow brush should be used, so that an up and down or rotary motion may readily be produced. Brushing the teeth across is productive of irritation and absorption of the gums and alveolar processes, exposing and cutting the necks of the teeth, which are liable, sooner or later, to decay. After brushing, and also after each intervening meal, a toothpick (quill) and floss silk should be passed between the teeth to remove any particles of food not dislodged by the brush. The necessity of these precautions will readily be seen, when the fact is taken into consideration that acids generated from decomposing food, left around and between the teeth, is the primary cause of decay.

Use of Tooth-powders and Mouth-wash.

Once each day a proper dentifrice should be used, for the reason that with this the teeth can be kept clean with much less brushing than with water alone ; the least amount of friction pro-

duced upon the teeth and gums, which will clean them from particles of food and mucus, is always preferable. A powder consisting of one part of precipitated chalk, one part of powdered castile soap, and one part of powdered orris-root, flavored with rose, wintergreen, sassafras, etc., to suit the taste, is as good as can be made. No dentifrice should ever be used with acid in it, nor any substance so coarse or sharp-cutting as to injure the enamel of the teeth, such as pulverized cuttle-fish, pumice-stone, or charcoal. Washes, so far as cleansing the teeth proper is concerned, are of no use whatever. The most of them, I am aware, are recommended and used, on account of their astringent properties, which, if the teeth are kept free from accumulations of tartar and food, is never needed. Bleeding and spongy gums are caused by tartar, etc., which must be carefully removed. The gums will then assume, and remain, in a healthy condition, provided proper cleanliness is observed.

Action of Medicines upon the Teeth.

The impression is widespread, that medicines of any description, if taken in large quantities for a long time, produce very injurious effects upon the teeth. That those impressions are well founded, so far as some medicines are concerned, there can be no doubt; but the great majority of drugs are as harmless to the teeth as cold water. Unfortunately, however, those which do harm to these organs, are needed, and are prescribed more frequently perhaps, than any others. They are the preparations of mercury, iron, quinine, and the mineral acids. Mercury, while it retains the liquid metallic state, is inert, but when taken internally, as in blue pill, for instance, it is thought to combine with the chlorine of the hydrochloric acid in the gastric juice of the stomach, forming a chloride, and thus becomes active. The vapor of this metal frequently proves injurious, in some instances exciting salivation, ulceration of the mucous membrane of the mouth, etc. Some of its compounds are violent caustic poisons. It is, however, more frequently administered in the form of blue pill, or the mild chloride of mercury (calomel). When given in large doses, the mucous membrane of the mouth, and the salivary glands take on increased secretory action, and become irritated and inflamed. The gums first show the mercurial influence by tenderness and swelling. The whole mouth soon becomes sore, the tongue is swollen and protruded, the saliva and mucus flows excessively, sometimes to the extent of several pints a day. At the same time the breath acquires a peculiar fetid odor, and the patient perceives a metallic

(coppery) taste in the mouth. When it is pushed too far, or administered to persons peculiarly susceptible to its action, a train of very serious symptoms, such as excessive salivation, ulceration of the gums, loosening, and perhaps loss of the teeth, and sometimes death of the alveolar processes and jaw-bones, follow. Should the teeth retain their positions in the mouth through the above described disturbances, the injury to them will be very serious notwithstanding. From the excessive inflammation of the gums, their proper nutritive supply is interfered with to such an extent that they become detached from the necks of the teeth, thus forming receptacles for tartar, which collects so suddenly, and to such an extent, that it requires all the skill of a dentist to prevent their ultimate loss from this cause.

Treatment.—In cases of salivation, the best and most simple remedy to use is chlorate of potash—a half-teaspoonful to a glass of water, or the same amount of common salt in a glass of water, to rinse the mouth and gargle the throat with, every hour or two.

The preparations of iron are some thirty in number; there are only two, however, which exert any marked effect upon the teeth, except to discolor them, viz.: the tincture of the chloride of iron (muriated tincture of iron), and the solution of the nitrate of iron; this last, however, is very little used. The first of these is probably more frequently prescribed than any other, if not all other preparations of this metal, on account of its astringent as well as restorative effect. It contains muriatic and nitric acids, which are employed in its manufacture. Both muriatic and nitric acids, even when *very much* diluted, have a great affinity for the lime-salts of the teeth; and it is no uncommon thing to see teeth very badly decayed from the effects of this preparation of iron.

Quinine, if taken in a dry state, or in the form of pills, can produce no injurious effects upon the teeth, but in order to make a solution (the form in which it is often prescribed, for the purpose of obtaining a more ready action), it must be dissolved in water acidulated with sulphuric acid. The acid reaction of the mixture is quite enough, however, if proper care is not taken, to produce destruction of the teeth in a comparatively short time.

In malarial districts teeth decay more rapidly than in other localities, because iron and quinine are taken in large quantities in the form of liquids, as described above, and I have no doubt that the bad teeth of Americans may, in a great measure, be accounted for, by the fact, that malaria is always much more prevalent in new countries, and that these acid preparations of iron and quinine are taken in such enormous quantities. Diluted sul-

phuric acid, diluted nitric acid, diluted muriatic acid, and diluted nitro-muriatic acid, are all administered, more or less frequently, as tonics. They all have a decided affinity for the lime-salts of the teeth, and dissolve them away very rapidly, unless great precaution is exercised. During the time any medicine containing a mineral acid is being taken, the mouth should be rinsed with a solution of bicarbonate of soda in water (a heaping teaspoonful to a glass of water), four or five times a day, in order that the acid may be so neutralized that the teeth cannot be injured by it.

Some Peculiarities of Dentition.

It has been prophesied that the time may come when the human race will become altogether toothless. As far as my observations have gone, however, the present indications are not particularly flattering for the immediate fulfilment of such a prophecy, but such cases do occur, now and then. The writer knows of two well authenticated cases : one, a gentleman who formerly lived in Rochester, and the other a lady residing a few miles out of Albany, in this State. Whether these two isolated cases point to a like condition of things throughout the entire human family, at some far distant day, I should hardly venture to suggest.

On the other hand, there are frequently found old people who say they have their third set of teeth, and I believe there are cases on record where it is believed such a thing has occurred. I never have seen such a case myself, however, and conclude that the teeth coming into the mouth so late in life, are either supernumerary teeth—so called—or are those of the second set, which have been kept from taking proper positions on account of the crowded and irregular condition of the teeth, or from malposition in the jaws.

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Diseases of the Digestive Organs.

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DISEASES OF THE DIGESTIVE ORGANS.

An English writer, I think it was, said that John Milton would never have written Paradise Lost, had he not suffered from dyspepsia; and Thackeray, in his "Roundabout Papers" remarks: "Ah! what a poet Byron would have been had he taken his meals properly, and allowed himself to grow fat—if nature intended him to grow fat"— . . . . "If that man had respected his dinner, he would never have written 'Don Juan.'"

Without doubt much of the incapacity for mental and physical labor which does not absolutely put a stop to active exertion; much of the worry and low spirits which are out of proportion to their tangible causes, and much of the suffering which may not always attain to positive illness, are to be traced to derangement in the function of one or more of the digestive organs. While other causes may lead to these derangements, imprudence in eating, or improper articles of diet, are doubtless to blame in the majority of cases. Individual peculiarities exist, it is true, in many instances, and render such persons more than ordinarily liable to stomach and intestinal disturbances; but even in these cases experience should soon teach what habits of eating and kinds of food ought to be avoided.

Popular writers on medical topics often assert that inhabitants of the United States are more troubled with digestive derangements than the people of other countries, and claim that this is because of the general use of improper modes of cooking. It is doubtful, however, if such causes are more active here than elsewhere, since the forms in which food is taken, as well as the substances used, are largely the result of experience as to what things are best adapted to the climate, modes of life, and circumstances of those who are chiefly concerned. It is not unreasonable to presume that all communities would be the better for increased knowledge upon this, as well as upon most other subjects.

If any exception were to be made to the above in the case of our own people, it would apply to the farming population. Many of this class are well able to afford a better dietary than that to which they accustom themselves, but they often lack either the knowledge or inclination to obtain it, and, as compared with the middle classes of large cities, are much the poorer fed. With abundant opportunities for procuring fresh and wholesome food, they often depend largely upon salted, smoked, and otherwise preserved meats; forego the use of farm-products that have a marketable value; neglect the making of a kitchen-garden in time to secure an early supply of fresh vegetables, and resort to modes of cooking which, while involving the least amount of labor, are calculated to produce disturbance of health and more or less permanent impairment of the digestive functions.

Not only is the food appropriate for different ages various in kind, but it should, within certain limits, be adapted to different climates and modes of life. Speaking generally, however, it is desirable that as much variety as possible should be aimed at in the selection of food, since too monotonous a diet is apt to lessen the appetite and throw an excess of labor upon particular portions of the digestive apparatus. During infancy, food which requires the action of teeth, will, if taken, fail to meet, at other points in the alimentary canal, with the fluids which are also needed for its disintegration. So, also, in old age, the stomach and intestines may fail to provide the means for digesting food, the structure of which makes mastication essential, but which the toothless jaws are incapable of performing.

So much has been said and written about the harmful effects of over-feeding that most people have failed to appreciate that underfeeding may be even worse. In most cases of indigestion from over-feeding the trouble is chiefly limited to disturbance of the digestive organs, and, unless too frequently repeated, is often of temporary duration. When, however, persons, and especially children, become habituated to too spare a diet, however well digestion may be performed at first, it will ultimately suffer in many cases, because the blood fails to contain the material out of which the digestive fluids are formed, just as it also fails to provide the elements needed for the growth of the body. Instances are not uncommon in which the health of children becomes seriously impaired, and future development is rendered imperfect, owing to excessive solicitude on the part of parents and others that they should not eat too much. In schools for girls, especially, too restricted or monotonous a diet (united with too strict an adherence to routine work and amusement) may lead to greater impairment

of health than could ever come from occasional over-feeding. It seems in some such cases, that, owing to the fact that the stomach is never fairly put upon the stretch, it fails to hold as much food as the nourishment of the system requires, and whenever food is taken, a feeling of satiety is reached which puts an end to further eating, even before a sufficient amount has been taken to nourish the body. In the days when tight lacing was fashionable and compression of the waist about the stomach and liver was often so great as to leave a permanent notch in the latter, the inability to take a full meal was quite explainable, and it is, perhaps, not surprising that in time it came to be considered unlady-like for a girl to eat as much as her brothers.

DERANGED DIGESTION, OR DYSPEPSIA.

There are few diseases affecting the body generally which are not attended with more or less disturbance of the functions of digestion. Indeed, many persons are accustomed to attribute to some trouble of this sort every attack of illness from which they suffer, and the majority, perhaps, of domestic remedies are of a nature to affect the digestive organs in one way or another. In many acute diseases the prospect of recovery depends largely upon the ability of these organs to accomplish their work, while in other maladies of a more chronic nature, it is an incomplete performance of digestion, and, consequently, imperfect assimilation of food, which greatly complicates the symptoms caused by the disease.

None of the symptoms connected with indigestion are exclusively characteristic of affections of the stomach and intestine, but the same symptom may sometimes be the result of quite dissimilar causes, so that persons not experienced in such matters may quite easily be misled. This fact makes it the more difficult to popularize the knowledge of this class of affections, or to give more than an outline of their nature and treatment, such as may serve to place the reader on his guard against allowing them to occur, or attempting to do that which had better be left to the judgment of a physician.

The symptoms which are most commonly referable to diseases of the digestive organs are: difficulty of swallowing, loss of appetite, inordinate or unnatural appetite, nausea, vomiting, hiccough, foul breath, belching up or eructation of gases, water-brash, heartburn, discomfort located between the shoulder-blades or in the abdomen, swelling of the belly, perceptible movements and noises

in the belly, infrequent or too frequent movements of the bowels, and unnatural character of the evacuations. In addition to these are certain other derangements which arise from disturbed digestion or disease of the digestive organs, which will be considered later. (See page 679.)

Solid food should always be well chewed before it is swallowed. This is necessary not only because it is thus rendered more easily acted upon by the gastric and intestinal juices, but it also is then mixed with saliva and bubbles of air. The former is of service in digesting starch, and stimulates the mucous membrane of the stomach to secrete gastric juice; the latter, by its admixture with the morsel of food, renders it porous and more capable of being digested. When food is "bolted" in unchewed masses, it frequently irritates the mucous membrane too powerfully and causes dyspepsia. Moreover, the fluid taken with it is not thoroughly mixed with the contents of the stomach so as to render the latter a soft, pulpy mass on which the gastric juice acts freely, and it is not until the excess of fluid has been absorbed that digestion takes place.

Although, as mentioned in the chapter on Anatomy, the quantity of gastric juice secreted during digestion is very considerable —amounting, it may be, to several pints—at no time is the quantity actually present very great, since, as rapidly as food is digested, it is dissolved in the gastric juice, and both together are absorbed into the circulation. The stomach continues to pour out fresh portions of the juice, and so the process goes on until stomach-digestion is ended. If, however, such absorption is interfered with, digestion is rendered difficult, and the contents of the stomach become unnatural. The active element in gastric juice is called pepsin. In order that it may act upon the contents of the stomach, the presence of an acid is necessary. Such an acid is formed in the stomach, and is now commonly believed to be hydrochloric. Certain other acids are capable of aiding this change in the food, but none are so efficient as the one named. Whenever the proportion of acid during the course of digestion falls below a certain limit, the process is retarded or altogether arrested, and thus fermentative changes may take place. In some cases there may be a deficiency of pepsin, but this is not so often a cause of tardy digestion as want of acidity.

The contractions which the walls of the stomach undergo during the presence of food have the effect of keeping its contents in continual motion, so that fresh portions are constantly brought into contact with the mucous membrane, moistened with gastric juice, and then mixed with other portions of the mass. These contrac-

tions have, however, none of the force of those which occur in the thick and powerful gizzard of fowls, and exert no such grinding influence upon the food as is there observed. When they are arrested, as during powerful mental emotion, or as a result of paralysis, the rapidity of stomach digestion is very considerably retarded.

Stomach digestion ordinarily occupies two to three hours, and is not only unaccompanied with any feeling of discomfort, but, on the contrary, most healthy persons, after taking a full meal, experience feelings of contentment and pleasurable emotions which, in themselves, favor rapid digestion. When, however, on account of ill-health, or the sudden occurrence of business or disturbing emotions, digestion is rendered tardy or altogether arrested, the contents of the stomach cause irritation of its walls, and there follows a sense of weight and discomfort. After a time, owing to the stoppage of digestion, and the presence of conditions capable of causing fermentation, decomposition takes place, unnatural acids and gases are formed, and the person suffers from heartburn, belching up of gas, bloating of the stomach, and increase of the sense of weight and discomfort, occasionally amounting to pain at the lower end of the breast-bone and between the shoulder-blades. Sometimes vomiting occurs and the stomach is emptied, but more often the contents escape into the intestine and there produce further trouble.

When the starchy elements of vegetables are not acted upon by saliva, the mucus of the stomach and the intestinal fluids effect their digestion, but it is probable that this is not so thoroughly accomplished as it would have been with the aid of the saliva. Moreover, when they have not been properly soaked with water in cooking or in the stomach, so as to swell and soften their grains, and they are passed into the intestine without such change having occurred, their digestion by the intestinal fluids is apt to be correspondingly slow, and they undergo decomposition. The effect of this is to render the fluids of the intestine acid instead of alkaline; to distend the bowel with gases, and, by the irritation produced, to lead to colic and diarrhœa.

Fat, still held in the connective tissue which encloses it as it is deposited about the muscles and in other parts of animals used as food, is sometimes not set free in the stomach, but escapes while still solid into the intestine. The pancreatic juice and bile which have the property of emulsifying it, or separating it into minute drops (such as exist in milk) fail, then, to fit it for absorption, and it either escapes unchanged from the body, or is only partly digested. Both in the stomach and intestines it may un-

dergo changes which convert it into substances unfit for absorption, and irritating to the mucous membrane of the bowel.

The nature of intestinal digestion is less understood than that which takes place in the stomach. It consists mainly, however, in the continuation of the process commenced in the latter and the conversion of fats, starch, and sugar into substances capable of being absorbed. The agents which accomplish these changes are the pancreatic juice, the bile, and the fluid secreted in the upper portion of the small intestine. It is here that many of the products of digestion are absorbed by the blood-vessels and lymphatics with which the mucous membrane is abundantly provided.

Feeble persons who are badly nourished, in whom digestion as well as other functions are sluggish, often derive marked benefit from taking one or another of the malt preparations. Whatever quickens moderately the contractions of the muscular coats of the intestine, and increases the secretion of fluids poured out by its glands, helps to improve the digestion of its contents. Rhubarb, in small doses frequently repeated, and nux vomica given in a similar manner, are classed among these agents.

Loss of Appetite.

This symptom is common to most diseases which are attended with fever, or which alter, in any considerable degree, the character of the blood. Anything which stimulates the secretion of gastric juice commonly increases the appetite—such as the thought of inviting food, and the effects of bitter, alkaline, or pungent substances upon the mucous membrane lining the stomach. In this way the various vegetable bitters, alcoholic drinks—especially ale and beer—red pepper, mustard, hot sauces, etc., produce their effects. Active exercise in open air, by quickening the circulation, hastens the flow of blood in the mucous membrane of the stomach, as well as in other parts of the body, and in this, as well as other ways, leads to an increase of appetite.

Unnatural Appetite.

In convalescence from acute diseases, and in cases of anæmia and chlorosis, in which the blood is lacking in the elements out of which gastric juice is formed, the capacity of the stomach to perform its office may be, for a time, quite limited, and although the appetite may be craving, food should be taken in less amount than in health and at shorter intervals. It is the irritation of the mucous membrane in such cases by undigested food which sometimes

causes relapses in typhoid, typho-malarial, remittent, and other fevers. In such cases the food taken during the first weeks of convalescence should be of the most easily digestible character.

When the mucous membrane of the stomach is subjected to prolonged irritation ; when worms or masses of undigested food are in the small intestine ; in certain diseases of the nervous system ; in some chronic diseases of the stomach and bowels, and sometimes during pregnancy, or in the disease known as chlorosis, we observe an unnatural appetite. Such persons not uncommonly prefer unwholesome things to those which they formerly preferred.

The Treatment of this symptom varies with the cause that produces it. In disease of the nervous system the diet of the patient needs to be regulated by some one whose judgment is more reliable than that of the patient. The freaks of appetite of pregnant women will pass away in time of themselves, and no hesitation need be felt about denying them the gratification of their wishes in this respect, for fear of harm to the infant.

Persons who are in feeble health have often a certain degree of derangement of the mucous membrane of the stomach, which accounts for their perverted appetites, and the use of subnitrate or subcarbonate of bismuth, in doses of a scruple, thrice daily, when the stomach is empty, may be of service.

When irritation by worms is the cause, their expulsion by such remedies as are mentioned under the head of **Intestinal Worms** (see Vol. I.), will be all that is required. When the morbid appetite follows prolonged fasting, food should be allowed at first only in very small quantities and at short intervals.

Nausea.

This may be a result of unpleasant emotions, or disagreeable smells or flavors. It very commonly follows the presence of irritating substances in the stomach, and is also caused by unnatural movements of the body—as in whirling, swinging, riding backward, the movements of a boat, etc. When carried to an extreme, nausea is followed by a feeble pulse, paleness and coldness of the surface, perspiration of the face, sighing, respiration, and, finally, by

Vomiting.

When the movements of vomiting, or the retching as it is called, are continued, the lower opening of the stomach is relaxed and admits the contents of the first portion of the small in-

testine. This is said to be owing to the peristaltic or "worm-like" movements of the intestine becoming reversed, but it is quite as likely that it is the result of the squeezing to which the small intestine is subjected by the abdominal muscles.

With the first portion of the intestinal contents which thus enters the stomach, we commonly have a quantity of bile which had already been in the intestine, or is expelled from the gall-bladder during the efforts of retching. It is supposed by many people that it is the presence of bile in the stomach which gives rise to retching, whereas, in fact, the reverse is usually the case.

When the vomited matter contains blood, there is reason to suspect the presence of ulcer of the stomach, cancer of the stomach, or some equally serious affection. The occurrence of this symptom should lead to the immediate procurement of the services of a physician.

Vomiting is sometimes a symptom following blows on the head or obstruction of the intestine, and is often seen in the commencement of scarlatina. Pregnant women are often much troubled by it.

Treatment.—Simple nausea may be relieved sometimes by a stimulant, such as five drops of camphor, or a teaspoonful of compound spirit of ammonia, or of compound spirit of lavender in a half-wineglassful of cold water; going into the open air; rest on the back; the application of a mustard poultice to the pit of the stomach; two drops of tincture of ipecac in a tablespoonful of cold water, repeated at intervals of ten to fifteen minutes; ten drops of chloroform in two tablespoonfuls of water—any one of these may be resorted to with a fair prospect of relief.

Should vomiting occur, it is often well to aid, at first, the thorough emptying of the stomach by drinking warm salted water, but when this is accomplished, continued retching serves only to render the muscles of the abdomen painful, to cause congestion of the mucous membrane of the stomach, and to force the contents of the upper portion of the intestine into the stomach, and thus add to the trouble. In such case the remedies above named may be resorted to, and small lumps of ice may be swallowed without chewing them.

When blood is vomited the patient should be kept absolutely quiet in bed, and on the back. Iced water, if it is available, should be applied over the stomach by means of cloths, or enclosed in a bladder or India-rubber bag. Small lumps of ice may be swallowed from time to time. The temperature of the legs and arms should be kept up with the aid of bottles filled with hot water. A doctor should be sent for at the earliest opportunity,

and the messenger should be instructed to explain the nature of the accident. For several days after a hemorrhage of this kind has occurred, only the very mildest form of food should be taken. Indeed, it is better for a day or two to take food by the bowel exclusively, and for a considerable period thereafter to subsist upon milk.

When the vomiting occurs in a case of intussusception or rupture, or when it is a symptom of gastric ulcer, or cancer of the stomach, it should be arrested as soon as possible and without resorting to the salt and water. When it is owing to a blow upon the head, or when it occurs during pregnancy, a dose of twenty to thirty grains of bromide of potassium or bromide of sodium in a wineglassful of water will often prove serviceable. Other remedies appropriate for the latter condition will be found in the chapter on Obstetrics.

Hiccough.

This is commonly the result of eating too rapidly or too abundantly, or is caused by irritating articles of food and drink. Drinking rapidly a considerable amount of cold water will produce it, and it is also seen in the last stages of some exhausting diseases.

Treatment.—The quickest way to relieve hiccough caused by over-eating or by alcoholic drinks, is to give an emetic. When it is caused by eating too rapidly, it will, ordinarily, soon pass off of itself. At such times it may also be of service to take a single swallow of cold water or a small lump of ice. Taking a full breath and holding it for a time, will sometimes stop the spasm.

Foul Breath

may be caused by escape from the stomach of gases which result from decomposition of food, but it may also be due to the presence of decomposing food in cavities in the teeth or tonsils, disease of the nasal passages, consumption, chronic bronchitis, or other diseases of the chest, or it may be owing to the escape through the lungs of the odor of substances in the blood. When gas escapes from the stomach, it is usually a couple of hours or more after eating.

Treatment.—Coarsely powdered charcoal is often of service as a temporary corrective. A tablespoonful may be taken in a half-glass of water. When it is of frequent occurrence, digestion should be aided by doses of ten drops of dilute hydrochloric acid, taken shortly after eating, in a wineglassful of hot water.

Water-brash or Pyrosis

is the raising of an alkaline or brackish fluid, sometimes in considerable quantity, but more often to the extent of a few mouthfuls only. It occurs when the stomach is empty of food, and the fluid bears no resemblance in taste to gastric juice, which is decidedly sour.

Treatment.—The remedy most resorted to is subnitrate or subcarbonate of bismuth in scruple-doses, taken when the stomach is empty, say about one hour before meals. When the water-brash is of frequent occurrence, the use of all alcoholic drinks should be avoided.

Heart-Burn or Sour Stomach.

This is often owing to some product of faulty digestion of fats, and is liable to occur after eating pastry and other articles containing fat that has been overheated in cooking.

Treatment.—When the character of the food is not the cause, but there appears to be an excess of gastric juice, one of the simplest remedies is a piece of bread or a cracker. It is customary to take, also, a half-teaspoonful of baking-soda in water, or soda-mint, or a glass of carbonic acid water to which a little bicarbonate of soda has been added. The soda in these cases neutralizes the acidity of the gastric juice, but is apt to stimulate the secretion of more. When the fatty food is the cause, the best remedy is an emetic, unless there are reasons which make it undesirable to produce vomiting. Bicarbonate of soda, as above recommended, or a teaspoonful or two of calcined magnesia in a little water, are likewise serviceable.

Discomfort in the Stomach and Bowels.

This symptom has many degrees of severity; from the uncomfortable fulness caused by flatulence or by over-eating, to the burning, stabbing pain of inflammation of the belly, the acute pain of neuralgia of the stomach, or the passage of a gall-stone along the bile-duct. The discomfort is not always greatest at the seat of the trouble causing it.

A feeling of weight is often felt at the lower end of the breast-bone, or at the "pit of the stomach" in chronic dyspepsia and in ulceration, and cancer of the stomach. In the former it is not unusual to meet also with pain in the back, just between or a little below the points of the shoulder-blades.

In diseases of the spinal column, and in the one known as acute dropsy of the brain, there is often pain in the belly. In some forms of uterine disease there is pain and tenderness on one or the other side, low down in the belly, or along the lower margin of the ribs on the left side. When the bladder is over-distended, pain is felt in the lower part of the belly, and extends into the genitals. Enlargement of the spleen, and congestion or inflammation of the liver may be attended with pain or discomfort in their respective regions. In colic of the large intestine, the pain is situated midway between the breast-bone and the navel, and is spasmodic in character. Pain on the right side, and about opposite the point of the hip-bone, may be a symptom of over-distention or inflammation of the commencement of the large intestine. In diarrhœa there is usually a feeling of bearing down, and of dragging, griping pains in the entire belly. During the passage of gravel from the kidneys to the bladder the pain is intense; it is greatest about the navel, and shoots downward into the genitals.

Swelling of the Belly.

When this is sudden and variable in amount, it is commonly due to distention of the bowel with gas. In hysterical women this sometimes occurs with great rapidity, but it is ordinarily owing to fermentation or decomposition of the contents of the intestine, and is accompanied with a rumbling and movement of wind from one part of the bowel to another. It is a not unusual effect of an ordinary cold, or of other causes which arrest digestion, and may continue to give trouble for several days. At intervals temporary relief follows the escape of gas. When the bloating is considerable, it prevents descent of the diaphragm during respiration, and the movements of breathing are proportionately quickened, especially in men, while women, who uniformly breathe with the upper part of the chest, suffer comparatively little inconvenience in this respect. Tympanitis, or flatulence, as this condition is called, is a prominent and painful complication of inflammation of the peritoneum.

Among the accidents which may result from flatulence, one of the most important is rupture or hernia. This most often occurs in the groins, where large blood-vessels pass into the thighs, or where the spermatic cords in the male, and round ligaments in the female, enter the abdomen. It may occur at the navel in women whose abdominal walls have been over-stretched by dropsy, pregnancy, etc., but it is most often seen in this situation in babies whose navels have not entirely healed; who have been

too tightly bandaged, and who, together with flatulent bowels, have prolonged fits of crying.*

It is not uncommon for women who have borne children to mistake the movement of gas in the intestine for the motions of a child in the uterus, and to persist in their belief in spite of the assurance of their physician that pregnancy does not exist.

Enlargement of the belly is also caused by dropsy; by tumors; by excessive fatness; by enlargement of the liver or spleen; by dilatation of the stomach; by accumulatian of fæces in the large intestine, and by pregnancy. The proper distinction between these conditions will usually require some skill.

Enlargements due to the liver, stomach, or spleen, commence above, and gradually extend downward. Ovarian tumors are first noticed below, and to one side (usually). The enlargement due to pregnancy is attended with signs described in the chapter on OBSTETRICS (see Vol. I.). Accumulations of fæces are most often noticed on the left side, and are firm to the sense of touch. A corresponding enlargement on the right side, opposite the point of the hip-bone, occurs in over-distention or inflammation of the commencement of the large intestine (see page 692). Sometimes the bladder becomes so enormously distended as to simulate the conditions just described, and require skilful observation for a recognition of its true character.

Treatment.—When flatulence is due to fermentation of food, a dose of two to four teaspoonfuls of Rochelle or Epsom salt in warm water, with the addition of a few drops of essence of peppermint, will clear out the intestine. When it has existed for some time, and the bowel has become over-distended, ten drops of tincture of nux vomica (for an adult) in water, every two hours, until four or five doses are taken, or a pill of three to five grains of assafœtida, followed by a saline purgative such as just mentioned, will be serviceable. In these latter cases, relief will follow the wearing of a flannel bandage constantly about the belly, provided it be pinned snugly. The treatment appropriate to the other forms of enlargement is mentioned elsewhere.

Diarrhœa.

This is not a disease in itself, but is merely a symptom that accompanies very many conditions of ill-health. Speaking generally, it consists of excessive frequency of stools, the matter passed being greater in quantity and more fluid than is natural. It may

* See also, Chapter on OBSTETRICS and Section on **Hernia.**

be caused by such mental emotions as anxiety or fear, and is, from this cause, seen among soldiers in the commencement of a battle; among students about to appear for examination, or in the case of persons in court awaiting a summons to the witness-box. It may be owing to excessive irritability or inflammation of the intestine, the peristaltic or worm-like movements of the gut becoming so increased in frequency as to expel its contents before the fluid portion has time to be absorbed. Or it may be the result of stimulation of the mucous membrane by the presence of irritating substances, like undigested, fermenting, or putrid food, or the presence of an excess of food or fluids, etc. It is ordinarily attended with feelings of discomfort or pain in the belly in proportion to the activity with which the intestine contracts upon its contents.

Diarrhœa is most common in hot weather, when the nervous system is exhausted by long-continued heat. When it is very prevalent in any particular locality there is reason to suspect the contamination of the drinking water with filth from sewers, drains, cesspools, and barn-yards.

The Treatment of diarrhœa depends largely upon the nature of its cause, but whatever that may be, its arrest is favored by remaining quiet in bed; by warm applications to the belly, and by the use of some form of opium in small doses repeated after each stool.

Specific directions will be found further on in this chapter in connection with the section relating to diseases of the intestine.

Constipation and Costiveness.

These terms are often used in the same sense, but really they have different meanings. In *constipation*, the amount of matter discharged from the bowel does not vary much from what is natural, but it is evacuated at too long intervals; whereas in the condition known as *costiveness*, not only may the evacuations be less frequent than natural, but the actual amount is considerably lessened. It is, without doubt, owing to their diminished quantity that the discharge in some instances is so infrequent.

Constipation has a great variety of causes. For example, in certain diseases of the nervous system the muscular coat of the intestine is rendered more or less inactive, and fails to propel its contents toward the rectum. In others these muscular fibres are in a state of spasm, and by rendering the canal too small for the ready passage of its contents, favor its accumulation and retention. During some forms of inflammation of the intestine the dis-

charge of fæcal matter ceases for a time. In some instances, pressure by a pregnant uterus or by a tumor narrows the cavity of the bowel so as to arrest its contents. Strictures, such as are mentioned in the sections upon **Hernia** and **Intussusception**, collections of worms and undigested food, have the same effect. Inflammation of some portion of the abdominal contents may bind down the intestine so as to lead to stricture, but, more frequently than to all of these, is constipation due to habit.

Ordinarily, the rectum in adults becomes filled with fæces in about twenty-four hours, and when a condition of moderate distention is reached—as is likely to be the case after a night's rest—the first meal taken in the day stimulates the muscles of the intestinal canal to more active contraction. The rapid addition to the contents of the rectum causes it to react, and they are expelled. If, however, the desire to empty the rectum is resisted, it grows tolerant of its contents and so, in time, becomes accustomed to retain a larger amount of matter. When once overstretched in this manner it is some time before it recovers its tone, and it becomes again and again over-filled, until the condition of over-distention and corresponding weakness of its muscular coat are more or less permanent.

The collection of masses of hardened fæces in the rectum leads not only to over-distention of its walls, but by interfering with the return of blood from the lower portion (which is commonly empty), the large veins of the mucous membrane become stretched, and form knots or swellings called hemorrhoids or piles. In the case of females, the uterus is crowded out of place, and the free circulation of blood in it is interfered with—producing derangement of its functions. Pressure upon the nerves which pass out at the deep notch in the rear of the pelvis, gives rise to neuralgia of the lower extremities.

When fæcal matter is too long retained in the higher parts of the large intestine, it undergoes absorption of its fluid portion, which is taken up by the blood. With the latter phenomenon there is not infrequently absorption, also, of so-called excrementitious substances which poison the blood and thereby affect the whole body. It is not uncommon to meet cases of the latter description in which the persons have headache, loss of appetite, disturbance of digestion, and some fever—symptoms usually attributed to "biliousness"— all of which are completely relieved by the action of a purgative which clears out the lower portion of the bowel. The relief which has followed the use of a cathartic at such times has, without doubt, led to the very common resort to such a practice by people who are slightly out of health from any cause. Such

symptoms as those just mentioned may, however, be due to very many other causes, and not infrequently the action of a brisk purgative when the bowel was not in need of it, has had most unfortunate results.

I well remember a gentleman who suffered from fatty disease of the heart, and who, thinking to relieve his feelings of ill-health, took three cathartic pills. The weakness which followed the action of the medicine was so great that he had barely strength enough to get from the water-closet to his room, and by the time a physician could be summoned from his house—next door—the feeble heart had stopped beating, and the man was dead.

Costiveness is owing, in most cases, to deficiency in the amount of fluids secreted by the intestinal tract or excreted from the blood; to deficiency of food, or to the fact that the food taken consists largely of substances which are capable of being absorbed into the blood, leaving little residue to pass out by the rectum.

This condition is very often met with in growing girls, who are tall for their age, badly nourished, hysterical, have a sluggish circulation, cold extremities, and a variable appetite. The latter symptom is not always present, however, since cases occur in which the appetite appears to be good, and the usual amount of food is taken, but in which the actual amount of fæces passed is lessened, and generally is in the form of small, firm lumps, coated with mucus.

In nearly all acute diseases attended by fever, costiveness is a notable symptom, and it is not infrequent, in pneumonia for example, for a week or more to go by without a movement of the bowel having occurred unless as the effect of medicine.

Treatment.—When neglect to empty the rectum is the cause, regularity in going to the water-closet, or drinking, on rising, a glass of cold water to which a teaspoonful of salt has been added, will ordinarily be quite sufficient if it is continued for a few days. The custom of eating fruit, such as an apple, or an orange, immediately after rising, is often sufficient to secure a movement of the bowel at the usual time. When the rectum has been over-distended it should be emptied with the aid of an enema of soap-water, and thereafter an injection of a small amount of cool water may be taken twice a day for several days, so as to cause the bowel to contract and prevent any accumulation of matter.

Among the laxative medicines which it may sometimes be desirable to take, there are few better than the compound licorice powder, of which senna and sulphur are the chief ingredients, or the elixir of buckthorn bark. Either of the above may be taken in doses of one to two teaspoonfuls mixed with water.

When the bowel fails to be emptied regularly during an attack of acute disease, the necessity for resorting to the use of cathartic medicine had better be left to a physician.

Constipation caused by spasm of the intestine commonly yields to the use of extract of belladonna, in doses of a quarter of a grain every four or five hours. When it is caused by pressure on the gut, and such pressure can be relieved, this should be done in preference to using purgatives. When the intestine is sluggish in its action, kneading and shaking the belly will often afford relief. When it is a result of stricture, enemas of salt and water (a tablespoonful to a quart) or soap-water is the only safe thing to be recommended here. When due to an intussusception or a hernia, the only remedies to be thought of are those which will relieve the obstruction.

When persons in comparatively good health suffer from costiveness, it is always safer and better to increase the quantity of food taken, or to add to the regular diet articles which increase the bulk of the fæces, such as coarse and raw vegetables, fruit, wheaten grits, oatmeal, rye bread, corn-meal puddings, etc., than to resort to the habitual use of medicines.

Changes in the Appearance of Fæcal Matter.

During adult life, changes in the character of matter discharged from the bowel in health are mainly due to the nature of the food and drinks taken. When the food contains undigestible particles, like seeds, husks, woody-fibre, etc., the irritation which they create increases the activity of the bowel and causes loose stools. An excess of drinks will have a similar effect upon their consistence.

During illness attended with fever, the odor of the fæces becomes unnatural, and sometimes exceedingly offensive. When the liver is inactive, or the bile is retained in the gall-bladder, the fæces become light in color, resembling clay, and have an unusually offensive odor. In some rare cases the duct of the pancreas becomes obstructed, and the pancreatic juice is not poured into the intestine during digestion. In such cases the fatty matter of the food is not absorbed, but passes out of the bowel. Then, also, is the fæcal matter extremely offensive, and the fat sometimes hardens, as the motions cool, into a waxy mass.

When blood escapes into the intestine from the rupture of a blood-vessel, or is discharged from the stomach, into which bleeding has taken place, the motions become tar-like, as during the first hours after birth, and they may also have a very offensive odor. The same effect follows the employment of enemas of fresh

blood, when the quantity used is greater than can be absorbed through the intestine.

Congestion of the mucous membrane of the bowel gives rise to loose and watery stools, whether the congestion be due to the presence of irritating food or other substances, or to inflammation of the mucous membrane, as in the inflammatory diarrhœa of summer, or the ulceration of the intestine following extensive burns of the skin, or as one of the conditions present in typhoid fever.

In epidemic cholera and in cholera morbus, the stools lose entirely their natural character, and consist of an acid fluid, having a slippery feeling when rubbed between the fingers, and holding a large quantity of flaky bodies in suspension, giving it the appearance of rice-water. The cause of this condition is sufficiently explained in the section on **Cholera.**

Worms of different kinds inhabiting the intestine, as well as their eggs, are occasionally found in the stools. (See **Intestinal Worms.**)

There is a form of inflammation of the bowel in which membranous casts of its inner surface are discharged with the stools. In other cases portions of the mucous membrane itself appear. In cases of intussusception (see Vol. I.), portions of the bowel may become separated, and come away. Gall-stones, matter from ulcerating surfaces, and foreign bodies that have been swallowed, are also occasionally found in the fæces.

In dysentery, blood and mucus are expelled, and there may be, for a time, an arrest of natural stools. Piles, too, give rise to bloody stools. In dysentery, the stools have commonly quite a characteristic odor.

Other Symptoms of Dyspepsia.

There are a number of symptoms which *may* have their origin in derangement of the digestive apparatus, but which, on account of their apparent lack of such connection, frequently mislead the sufferer and cause unnecessary anxiety. Among these the most common are dizziness, headache, loss of memory or inability to use the mind continuously, irritable temper, low spirits, shortness of breath, palpitation or irregular action of the heart, trembling and weakness of the muscles, change in the color of the skin, and pains in the back and sides.

The occurrence of the first group of symptoms connected with the brain, sometimes leads to the belief that softening of the brain, apoplexy, paralysis, or some other disease of the nervous system

is threatened. A little attention to the digestive function will show, however, that the latter is in some way deranged, and following its restoration the head symptoms will disappear.

Palpitation and shortness of breath likewise cause some persons to believe that they have disease of the heart or lungs.

Muscular weakness and trembling may not only attend disturbed digestion, but they also are due to too prolonged abstinence from food. Women who have no appetite for breakfast, and who are attacked with fits of "weakness" about the middle of the day; persons who are addicted to the immoderate use of alcoholic drinks, and who therefore take too little food; business men, who neglect to take a lunch in the middle of the day, and who, it may be, have taken but a light breakfast, owing to the diversion of their minds by reading a morning paper or being called away to other affairs while they were eating, are among the number who suffer from this symptom. Not unfrequently, their coffee or morning cigar have been blamed for the trouble, and in the case of inebriates it has been counted among the effects of alcohol upon the nervous system. In numbers of such instances, however, a plate of hot soup, a glass of milk, or a cup of chocolate and milk, will speedily relieve the trembling, and a resort to an alcoholic stimulant, as a "pick-me-up," is entirely uncalled for. Indeed, it is like the spur used on a jaded horse, and adds none of the strength which comes from taking some form of quickly digestible nourishment.

To recapitulate:—Dyspepsia, indigestion, or painful digestion, is not in itself a disease, but is a symptom that may attend various conditions of ill-health.

It may temporarily follow some indiscretion in eating or drinking, especially at a time when, from fatigue or ill-health, the stomach fails to perform its office, or:

It may be owing to actual disease of some one or more of the organs of digestion resulting from prolonged misuse of them, or coming on in the course of other diseases.

When following temporary causes, in a person otherwise healthy, no medicine is usually needed, but rest, abstinence in eating and drinking for two or three days, will restore health.

When the trouble is more constant, the habits of life may require to be altered, and remedies may be used for the various symptoms, as before enumerated. When these do not prove soon efficacious, a physician should be consulted.

DISEASES OF THE DIGESTIVE ORGANS.

Stricture of the Gullet or Œsophagus.

A constriction or narrowing of the gullet may be owing to spasm of its muscular coat at some portion of its length—as in hysterical persons, or when something irritates the nerve going to these muscles. It may be caused by the pressure of a tumor—such as an aneurism or dropsy of the heart-sack. When corrosive poisons are swallowed or when, in other ways, ulceration of the mucous membrane lining this tube is produced, a narrowing of its calibre is pretty certain to follow if the patient survive for any length of time.

Even a moderate constriction causes difficulty in swallowing, and is apt to lead to dilatation of that portion of the tube above the narrowed part. Cases occur in which this pouch-like dilatation retains for a time a large portion of the food swallowed, until, finally, it is expelled from the throat without having ever entered the stomach.

Symptoms and Results.—In these cases the difficulty of swallowing, and the discomfort which attends the act are among the most prominent symptoms. Hysterical cases ultimately recover. Those caused by the action of corrosive poisons, ulcerations, cancer, etc., may after a time cause such obstruction to the passage of food, as to reduce the sufferer to a process of slow starvation.

Treatment.—Fluid or very soft food should be the only form taken, and enemas of nutritious substances should be used as freely as possible, in order to avoid the irritation caused by the passage of food through the strictured portion of the gullet. A smooth bougie should be passed through the stricture at regular intervals by a physician, so as to dilate it.

Inflammation of the Stomach—Gastritis.

This is a quite common disease, if we limit the meaning of the term to an inflammation of the mucous membrane, or catarrh of the stomach as it is sometimes called. On the other hand, an inflammation of the entire thickness of the walls of the stomach is rare unless produced by irritant poisons or injuries. *A large proportion of those who suffer from dyspepsia have the simple variety,* either as acute attacks from which they recover more or less completely, or in a chronic form.

The Cause of inflammation of the stomach may be exposure to

cold; the presence of irritating, imperfectly chewed, or spoiled food; over-fatigue, followed by hearty eating; excessive use of alcoholic drinks, and especially the habit of drinking strong liquor when the stomach is empty; immoderate use of condiments, etc. Those who are convalescing from acute disease are liable to attacks, and so, especially, are infants.

There are other causes than those originating in the stomach itself, or in faulty habits of eating, such as diseases of the lungs, heart, liver, and kidney, and anæmia or impoverished blood. The first three commonly act by interfering, in some way, with the natural flow of blood from the veins of the stomach, whereby the small blood-vessels are over-distended, the mucous membrane is congested, and inflammation is more easily awakened than it otherwise would be.

In certain forms of disease of the kidneys the stomach, intestine, and skin, supplement, to some extent, the function of the diseased organs, and, in such cases, chronic derangement of the whole alimentary tract is liable to take place. The vomiting and diarrhœa which then occur, serve to remove the poisonous urea from the body.

Symptoms.—When poisonous substances are the cause, there is violent burning and stabbing pain in the stomach and between the shoulders, with tenderness on pressure over the former. The breathing is rapid and short, and efforts at vomiting continue long after the stomach has been emptied. Thirst is excessive. After a time the pulse grows feeble, the surface cold, there is faintness, hiccough, and, perhaps, diarrhœa. The matter vomited after the stomach has first been emptied, consists of stringy mucus containing blood, bile, and sometimes shreds of mucous membrane.

In the form which follows an alcoholic debauch, aggravated, it may be, by exposure to cold and improper or immoderate feeding, the symptoms may be somewhat less severe than the foregoing, so far as relates to the faintness, collapse and the vomiting of portions of the mucous membrane, but there are still pain and tenderness at the pit of the stomach, the tongue is coated, the breath foul, the stomach refuses to retain anything unless occasionally it be small lumps of ice and very cold drinks; but the latter, as they become warm, are also ejected, together with ropy mucus, and perhaps a little blood. Appetite is entirely lost, there is some fever, and there may be headache and restlessness.

In cases of *chronic* inflammation of the stomach, the prominent symptoms are those of dyspepsia; and it is safe to say, that in nearly all cases of prolonged indigestion, this kind of inflamma-

tion will be found to be present. While such persons may, at times, be comparatively comfortable, and digestion may be fairly performed, any of the causes which have been mentioned as likely to produce an acute attack will aggravate their trouble for the time. Such cases are sometimes called "gastric fever."

Those who suffer from inflammation of the stomach have occasional attacks of headache, terminating in vomiting. The appetite is either poor, or, when the irritation is considerable, there may be a constant craving for food or drink, but taking even a moderate amount of either causes a sensation of discomfort or pain which continues until it has been vomited or has passed into the intestine. When vomiting occurs, the matter will sometimes be found to contain undigested food taken many hours previously. Sometimes, in the intervals of digestion, and especially after a night's rest, a clear brackish fluid will be spat up, having no sour taste like gastric juice, but being composed largely of saliva that has been swallowed. Low spirits, bad breath, belching up of gas, heartburn, pain between the shoulder-blades, palpitation of the heart, bloating of the belly, and constipation, are among the other symptoms which, more or less constantly, torment the sufferer.

Treatment.—The treatment of the severe form, following the swallowing of irritating substances, demands that the stomach should be first emptied of its contents (if this has not already taken place) and rinsed out with draughts of warm water. After this has been once and speedily accomplished, the stomach should be put absolutely at rest. A hot flaxseed poultice should be applied over the upper belly, or cloths wrung out of cold water, or a bladder partly filled with pounded ice should be similarly applied, whichever may give the most comfort. Small bits of ice may be swallowed whole from time to time, being careful not to allow so much as will fill the stomach with water and encourage vomiting. All foods and drinks should be given by the bowel with the aid of a syringe. If coldness of the skin and faintness occur, cold applications should be removed and bottles of hot water be placed about the body and limbs. At the same time a tablespoonful of brandy added to a half-cupful of quite warm gruel or starch-water, may be thrown into the bowel with a syringe. Opium may be added to the enemas in doses (for an adult) of twenty-five to thirty drops, repeated, in very severe cases, every hour or two; but great discretion is required in repeating the dose more than three or four times, or after there is a tendency to drowsiness.

If recovery follows, no food or drink should be taken into the stomach for several days, but nourishment should be entirely

by the bowel. For this purpose, milk, beef-tea, and fresh blood which has been deprived of its clot by beating with a stick and straining, are the most available.

Inflammation of the stomach following a debauch must be treated in much the same manner as above indicated, but it is sometimes possible to administer by the mouth, doses of a half- to one grain of powdered opium, and a half-drachm of subnitrate of bismuth, at intervals of two or three hours. In such cases it is safer to restrict the opium to two or three doses, except when advised by a physician, while the bismuth may be continued.

Mustard and flaxseed meal poultices to the pit of the stomach; covering the patient with hot blankets so as to cause free perspiration; occasionally swallowing ice to relieve thirst, are all serviceable and safe procedures.

The only successful mode of relieving chronic dyspepsia due to disease of the heart, lungs, liver, etc., is by improving the condition of the diseased organs—often a matter of extreme difficulty.

Persons who suffer from dyspepsia due to chronic inflammation of the stomach, need to exercise much care in order to effect a cure, and they are constantly liable to bring about a temporary increase of their troubles by indiscretions in diet and habits of life. When food is not easily digested, but remains for hours in the stomach, it is well to take, before each meal, a half teaspoonful of bicarbonate of soda (baking soda) in iced water, or to take a glass of cold Vichy, Selters, or Apollinaris water, since alkalies and moderate stimulation, like that caused by a small quantity of very cold water, increase the flow of gastric juice.

Great care should be taken to thoroughly chew all solid articles of food, not only in order to render their digestion easier, but also because the alkaline saliva which is thus mixed with them serves to cause a greater flow of gastric juice. It is the relief which follows the swallowing of saliva in certain cases, which leads some people to acquire the habit of chewing spruce gum or paraffin after eating. So, too, the practice of smoking tobacco after meals, stimulates the salivary glands and indirectly increases the flow of gastric juice.

One of the most valuable aids to *slow stomach-digestion* is a dose of five to fifteen drops of *dilute* hydrochloric acid in a wineglassful of hot water, taken about an hour after eating. This, and all other acid medicines, should be taken through a straw or glass tube, and the teeth should be rinsed immediately afterward with a solution of baking soda and water.

Pepsin is another aid to slow stomach-digestion. If it is fresh and of good quality, the dose does not need to be large, since its

action in digestion is that of a ferment, and not a chemical one. It should always be given with dilute hydrochloric acid, in the manner above mentioned.

When *bloating of the stomach* is a pretty constant source of trouble, doses of sulphite of soda, from one to two scruples in a little cold water, will arrest the fermentation temporarily. Creosote is another remedy used for a similar purpose. It may be taken in doses of two to five drops in pill form, or mixed with some kind of mucilage. Coarsely powdered charcoal may also be taken in doses of a tablespoonful in water.

Acidity and heart-burn occurring to any extent during digestion may be relieved by a half-teaspoonful of bicarbonate of soda in water, or a teaspoonful of calcined magnesia may be similarly used. If the irritation be considerable, it will be better to take an emetic of warm water, or twenty grains of powdered ipecac in water, and by the free use of draughts of tepid salt-water to thoroughly empty the stomach of its contents.

When heart-burn occurs with an empty stomach, it is sometimes owing to the presence of gastric juice secreted in consequence of some irritation of its mucous membrane, and a cracker or some similar article of food will absorb it and put a stop to the trouble. If it does not, a doctor should be consulted.

When attacks of *acute inflammation* occur, the stomach should be allowed to rest as long as possible without the presence of food, since the latter not only aggravates the trouble, but often fails to be digested, and it would have been better not to have taken it at all. In cases occurring among delicate persons in which prolonged abstinence may be harmful, it is better to give necessary nourishment by enemas during the first forty-eight hours.

Every person who suffers from chronic indigestion, or indeed from any prolonged disturbance of the digestive organs, should wear at all times a bandage of flannel, pinned or tied snugly about the bowels, and wide enough to extend from the pit of the stomach nearly to the pubis. He should eat regularly of easily digestible food, avoiding only such as his experience shows to be slow of digestion, and when the amount that the stomach will tolerate at any one time is small, meals should be taken more often than thrice daily. The interval between meals should, however, never be so short as to allow the introduction of fresh food into the stomach while that which is partly digested still remains. Spices, very hot drinks, and all alcoholic beverages should be carefully avoided, and the discomfort occasionally caused by the irritation of wholesome food may be relieved with doses of twenty grains of bismuth subnitrate. It is serviceable to resort at intervals

to the use of mineral waters containing salt, bicarbonate of soda, and sulphate of soda. (See chapter in Vol. I. on Mineral Springs.) Those whose occupations are sedentary, should daily take a certain amount of walking, riding, or rowing exercise, and men should so arrange their clothing that pressure by waist-bands may not come across the region of the stomach. The habit of going without suspenders, and depending upon a tight waist-band for the support of pantaloons is decidedly harmful.

Neuralgia of the Stomach—Gastralgia.

Women are more liable than men to a nervous affection of the stomach, characterized by intense pain, but the cause of which is little understood. In men it sometimes occurs during an attack of gout, and during its continuance the pain in the joints may disappear. The pain is of a griping, "clawing" character, most severe at the lower end of the breast-bone, and may cause the patient to become unconscious.

The Treatment most effectual is the administration of opium in doses of twenty drops of the tincture, repeated every half-hour until the pain becomes easier; and the use, at the same time, of hot foot-baths, and hot poultices over the stomach.

A physician should be summoned as soon as possible, since his judgment will be necessary in regulating the amount of opium that may be used with safety.

Inflammation of the Bowel.

This occurs in several forms, viz.: a simple inflammation of the mucous membrane, similar to that which affects the stomach and which depends upon the same causes; a more acute form, common among infants and known as "cholera infantum;" that which is characterized by ulceration of the mucous membrane; still another, which most often occurs about the commencement of the large intestine, and is the result of accumulation of fæces, or the impaction of some foreign substance into the vermiform appendix to the large intestine; another form occurring in disease of the kidneys, spleen, or liver; the inflammation of the large intestine, known as dysentery or bloody-flux, and in inflammation of the peritoneum—the smooth, serous membrane which covers the intestines and lines the walls of the abdomen.

The first variety often accompanies a similar condition of the stomach, or is caused independently by exposure to cold or the irritation of worms, etc.

Symptoms.—The most prominent of these is diarrhœa, or loose and frequent stools; the others resemble closely those which characterize acute dyspepsia (see page 681), when the upper portion of the small intestine is affected; and dysentery, when the lower portion of the small intestine or the large intestine are its seat. There is discomfort, and griping, perhaps, a coated tongue, some fever, loss of appetite, and headache. When the trouble becomes chronic, the sense of discomfort is more constant, although less severe; there is bloating of the belly and loose stools, which may contain mucus, or yeasty and bad-smelling matter. When the disease lasts for some time, it interferes with nutrition and the patient loses flesh, owing to the degree of interference with the absorption of food through the mucous membrane.

The form which affects infants has already been considered in Vol. I.

The Treatment of inflammation of the bowel demands rest on the back, in bed. If the trouble arise from the presence of irritating food, a saline purgative such as two teaspoonfuls of Rochelle salt in water; a similar amount of Epsom salt; or a pint of solution of citrate of magnesia; or two teaspoonfuls of elixir of buckthorn, will clear the bowel; after that, laudanum may be given (to an adult) in doses of ten drops, in water, after each movement of the bowel, or a teaspoonful, or two, of paregoric elixir may be given at similar intervals in a half-wineglassful of *hot* water. A light but hot poultice of flaxseed or corn meal, or a bag of flannel filled with hops and wet with hot water or hot vinegar, may be laid across the belly. Many of the attacks of "loose bowels" occurring during warm weather or following exposure to cold or wet, etc., may be relieved by Squibb's Diarrhœa Mixture, mentioned among the formulas at the end of this volume.

Nausea and thirst may be relieved by acid drinks, like lemonade or a solution of cream of tartar in water, but should be taken in small quantities when cold, if their use is found to increase the griping. Flaxseed tea with lemon-juice is a good drink, and teas of sage and catmint are especially suited to cases attended with flatulence. For some days after the patient begins to improve, mild and easily digested food should be the only kind taken.

In all these cases the wearing of a flannel bandage snugly fastened about the bowels should be attended to for some days after the attack, and those who are liable to this disturbance will often avoid such attacks by making such use of flannel constantly.

Colic.

An affection of the bowel which is extremely painful, which is usually unattended with inflammation, and which is liable to be confounded with other diseases of a more serious character, is intestinal colic.

Colic is often a spasm, or a series of spasms of the muscular coat of the large intestine or colon, and may commonly be traced to the presence of irritating substances. The chronic lead-poisoning of painters and others, is another form, and some people suffer an attack of colic from taking small doses of opium—such as are used in cough-mixtures and the like. Over-distention of the intestine with gas, also may cause it.

There are other painful troubles liable to be mistaken for colic, viz.: the passage of a gall-stone from the gall-bladder into the intestine; neuralgia of the stomach; the pain attending ulcer of the stomach; sudden perforation of some organ which allows an escape of its contents into the abdominal cavity; strangulation of a hernia; the passage of a calculus from a kidney through its ureter to the bladder, etc.

Symptoms.—In true intestinal colic the pain is greatest (usually) about midway between the end of the breast-bone and the navel; extends across the belly; commences with a feeling of discomfort, and finally increases to acute pain, which recurs in paroxysms, with intervals of comparative comfort. The pain is ordinarily relieved by pressure, and does not often cause vomiting or faintness, although these may occur. It is most apt to come on during the night, in which respect it resembles most other bowel complaints.

Treatment.—When caused by gas, the adoption of a position which raises the hips as high as possible above the level of the stomach will sometimes cause quite rapid relief with the escape of the flatus. Ordinarily, however, it is necessary to give a dose of fifteen to thirty drops of laudanum (to an adult), which may be followed in an hour, if needed, with twenty drops more. A hot poultice of flaxseed meal may be applied. After the pain has ceased, a purgative of some kind should be taken to clear away whatever may have caused the trouble.

Dysentery—Bloody Flux.

This disease has two varieties, viz.: the sporadic form, or that which is caused by exposure to cold and similar special causes,

and the epidemic form, which afflicts armies, and which prevails during periods of famine.* It is most common in hot countries, where the land is low and wet. It has, however, no connection with malaria, so far as has yet been proven. Hunger, overwork, and bad air favor its development; but the exciting cause, of the epidemic form especially, is presumed to be foul drinking-water.

In the course of the disease, the mucous membrane of the large intestine becomes intensely congested and inflamed, the solitary glands become swollen, and afterwards ulcerate; the folds of mucous membrane become covered with patches of false membrane, similar, somewhat, to those which occur in the throat during diphtheria; the whole thickness of the intestine is swollen and boggy, and the mucous membrane becomes detached in places, so as to leave raw, ulcerating surfaces.

Sometimes the inflammation may extend upward into the small intestine, though this is not common.

Symptoms.—At first the patient may be only feverish, and have occasional chilly sensations and griping pains in the belly. By and by there comes a sudden desire to empty the bowel, followed by a large and natural movement unattended with any difficulty. In a short time, however, the desire recurs, and presently becomes constant. The stools become small in quantity, lose their natural character, and consist mainly of slimy mucus, with, perhaps, a little fæcal matter in small, hard lumps. The griping pain in the belly increases, blood makes its appearance with the mucus, and the stools acquire a very offensive odor, which is quite characteristic of the disease. Each movement from the bowels is attended with violent spasms of the intestine; the fever increases, the tongue becomes coated; the skin is dry and harsh, and the belly bloated and tender.

After the disease has continued for a little time the stools lose their gray or colorless, jelly-like appearance, and become watery, resembling in color the washings of meat. Sometimes the discharges resemble matter (or pus) after the disease has continued for a few days. When the disease is at its height, the urine becomes scanty, high-colored, and its passage painful. There is loss of appetite, and, perhaps, vomiting. The pulse becomes feeble, and, when the disease is likely to end fatally, the extremities grow cold, there is hiccough, the pain in the belly becomes less, or quite ceases, and the patient gradually sinks into a stupid state just before death occurs.

Generally, recovery takes place when the disease has lasted from

* See also the chapter on Acute Infectious Diseases.

one day to a week or ten days, but not uncommonly the severity of the symptoms abate and the disease becomes chronic, and may then last for years, giving the patient more or less discomfort from pain in the bowels and frequency of movements.

Treatment.—It is the custom of many physicians to give a single purgative at the outset of the attack to clear the large intestine of fæcal matter. For this purpose a full dose of Epsom salt (a tablespoonful), or castor oil, or a dose of eight to ten grains of calomel, is preferred. After that, opium is administered in the form of laudanum (ten to fifteen drops after each stool), or Dover's powder (eight to twelve grains at similar intervals), or by the hypodermic injections of morphia. In India it has become customary to give, from the outset, large doses of ipecac—twenty to thirty grains combined with a grain of powdered opium, and repeated every six to ten hours.

An enema of a wineglassful of *cold* water will often relieve, for a time, the sense of discomfort in the rectum. So, too, fifteen drops of laudanum may be mixed with four tablespoonfuls of boiled starch (such as is used for starching linen), and injected, while warm, into the bowel. Cloths wrung out of cold water may be applied to the belly and will sometimes relieve the burning sensation. At other times hot poultices, or hot water applied with flannel, will give most comfort.

During the attack, gruels, milk, jellies of tapioca, sago, etc., are the most appropriate food. After recovery from the acute symptoms, the diet should be carefully regulated for some time, all irritating substances and food which is difficult of digestion being avoided.

When the disease occurs in hot, low countries, a removal as soon as possible to a cool, dry climate and to high land, will aid in complete recovery, and will oftentimes prevent the disease continuing in a chronic form. As mentioned in a preceding section, a flannel bandage should be worn about the belly after convalescence has commenced.

Inflammations, Unnatural Growths, etc.

Besides the foregoing affections, the stomach and intestines are liable to certain general and local inflammations and morbid growths, such as peritonitis or inflammation of the interior of the belly, ulceration of the stomach and intestine, inflammation of the pouch-like commencement of the large intestine (called *typhlitis*), cancer, tubercle, etc. Most of these are attended with symptoms of indigestion which complicate those properly belonging to

the disease, and a detection of the true character of the malady requires the skill of a physician.

Peritonitis.

This is one of the gravest forms of inflammation of the bowels when caused by the presence of foreign matter in the peritoneal cavity, as occurs with perforation of the intestine or stomach, rupture of an abscess internally, or when the abdomen is penetrated by some foreign body. When the peritoneum is injured, as in the case of operations when it becomes necessary to open the abdomen, it is less liable to be followed by fatal results; and the forms of local peritonitis which are developed in inflammation of the organs in the pelvis, or in adhesions of the intestine or stomach caused by ulceration, are still less dangerous to life, although fatal results occasionally are observed.

Symptoms.—The patient who suffers a rupture of intestine or of an abscess, has a sudden attack of pain, faintness, shortness of breath, a cold skin, clammy perspiration, great restlessness—in fact, the usual symptoms of a shock to the nervous system.

The pain which soon follows is of a burning, stabbing character, extending more or less over the whole belly, except in cases where it occurs in the pelvic cavity. The patient is forced to lie quietly on the back, with the shoulders raised and the knees drawn up to relax the muscles of the abdominal wall and to relieve the belly from the pressure of the bed-clothing. Owing to the pain caused by a deep breath, the diaphragm is not used in breathing, and the respirations are therefore short and hurried. There is fever, thirst, and, it may be, vomiting. The bowel and bladder cease to act, and gas collects in the intestine until the belly may be bloated and drum-like.

The inflammation may terminate in death within a few hours, when caused by rupture of the intestine or of an abscess, or it may continue for several days, and end either in recovery or in death by exhaustion, consciousness continuing until life has nearly ended. In the latter case it is not infrequent for the pain to cease entirely toward the close, to be followed by hiccough and all the symptoms of intense prostration.

Treatment.—Opium, in some form, is absolutely essential, and the use of cathartic medicines is, on the other hand, to be positively forbidden. Opium or morphia act by stopping the contractions of the intestine, and by relieving the intense pain. Very large doses are sometimes requisite to produce this effect, and are much better borne than would be possible during health.

Cloths wet with iced water, or a large bladder or india-rubber bag lightly filled with pounded ice, may relieve the burning pain in the abdomen if their weight can be borne. If the lower bowel contains fæces to such an extent as to cause trouble, enemas of warm salted water may be used with caution, to wash it out. Ice may be swallowed in lumps to arrest vomiting and relieve thirst.

There is hardly an affection which demands such constant attendance of a physician, or which, even then, is so liable to end fatally.

Typhlitis.

This term is employed to indicate inflammation of the cæcum, or commencement of the large intestine. At this point the intestine forms a pouch-like enlargement, into one side of which the small intestine discharges its contents. Opening into this pouch or cæcum, is also a short "appendix," as it is called, about the size of a goose-quill, and from one to three inches in length.* Into this worm-like appendix, seeds, bits of bone, gall-stones, fæcal matter, and even intestinal worms sometimes enter, and by their presence produce inflammation. Fæces become impacted in the cæcum itself, so as to over-distend it, and cause inflammation. Ulcers may also be located here, and give origin to inflammation of the parts surrounding them.

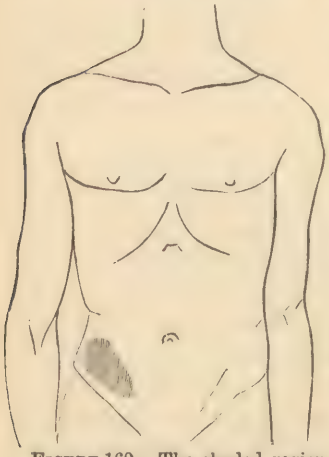

FIGURE 160.—The shaded region on the right side is the seat of the pain and swelling in inflammation of the commencement of the large intestine. (See chapter on Anatomy in Vol. I. for the arrangement of the intestine in this locality.)

The accident most liable to follow inflammation of the appendix is the formation of an abscess, which discharges either into the cavity of the abdomen, and causes fatal peritonitis, or into other cavities, such as the bowel or bladder. In some cases the inflammation subsides with the escape of the impacted fæces, or, if an abscess form, its contents are discharged through the walls of the abdomen, or through some of the channels just mentioned.

The Symptoms of typhlitis are pain and tenderness in the right side of the belly, near the point of the hip-bone. Pressure with the ends of the fingers will detect a firm body when the disease is caused by impaction of fæces. Fever follows, and the oc-

* For anatomy of the large intestine see Vol. I., pages 87 and 96.

currence of chilly sensations may be taken as an indication that matter has formed.

There is not usually much disturbance of the stomach, but constipation generally exists from the outset.

Treatment.—Do not give purgatives, but resort at once to hot and light poultices, and the use of opium to quiet pain and arrest the contractions of the intestine. If hot applications do not afford relief, resort may be had to a bladder filled with pounded ice. Enemas of soap-water to empty the lower bowel, may be desirable, but had better be repeated than used in too large a quantity at once. Absolute quiet must be maintained, owing to the danger of rupture of an abscess—if one have formed—into the cavity of the belly.

Those who have recovered from the disease are very liable to be subsequently attacked, and need to exercise constantly great care respecting their diet and the condition of their bowels.

It hardly needs to be said that the treatment of a disease of such severe character should not be attempted without professional aid.

Ulceration of the Stomach and Bowel.

In some cases the causes of this condition are not understood, and not unfrequently the symptoms are so complicated with those of indigestion or with loose bowels that they can only be appreciated by a physician.

When ulceration of the stomach occurs, vomiting of blood, and pain coming on shortly after eating and ceasing when the stomach is empty, are the most notable symptoms. The course to pursue when blood is vomited has already been referred to on page 670.

Ulceration of the bowels generally gives rise to diarrhœa of a more or less persistent character, sometimes resembling dysentery.

Neither of these affections can be treated without professional advice.

Cancer of the Stomach.

This is a disease that rarely appears before middle life. It is attended with pain at the "pit" of the stomach, which is increased about an hour or two after food is taken, at which time the contents of the stomach are passing into the intestine.

Food is sometimes vomited, and may occasionally be streaked with blood. Besides these local signs, the patient presents the general appearance of those who suffer from cancer of other portions of the body. (See **Cancer.**)

Any prolonged duration of these signs of disease should lead to consultation of a physician.

Other Diseases of the Digestive Organs.

There are certain other diseases of the stomach and intestines besides those above mentioned. Their symptoms are, however, too obscure or complicated, and their occurrence too infrequent, to make their description in these pages desirable. Those, however, connected with the rectum, are of such importance that they are embraced in a separate chapter.

Diseases of the Liver.

The anatomy and physiology of the liver have been so sufficiently well described in Vol. I., that what follows here will relate mainly to the common derangements of this organ.

Of all the causes which lead to liver derangements, it is probable that none are more important than the habitual use of alcoholic drinks. Next to this may be reckoned syphilis (either inherited or acquired), long-continued malarial poisoning, or residence in hot and low-lying regions, and diseases of other organs which interfere with the circulation of blood in the liver.

The last might, perhaps, be counted as second in frequency in the greater part of the United States. Some diseases of the organs in the abdomen, particularly those of a malignant character, give rise to similar affections in the liver, owing to the transfer of the elements of the disease through the medium of the blood-vessels. It has been customary to attribute to over-eating, or to the eating of too large a proportion of fats and sugars, conjoined with a sedentary life, the cause of some of these diseases. It is doubtful, however, whether this is the case as often as has been commonly supposed.

Ignorant and unscrupulous physicians have long made "*liver complaint*" and "*biliousness*" a cover for their lack of knowledge; and many diseases, of quite another nature, have often been classed under one or the other of these heads. So fixed have the minds of many people become of the truth of such statements as these persons find it in their interests to make, that there are few nostrums, or secret and patented remedies which find so large a popular sale as "Liver Pills," "Liver Invigorators," "Liver Pads," and similar preparations that are presumed to regulate the action of this gland.

Many of the symptoms which attend derangements of the liver

are also more or less characteristic of other maladies. Indigestion, for example, is not uncommonly present for some time before the attention is directed to the liver as its primary cause ; diarrhœa or constipation may likewise exist, and piles or hemorrhoids may give more or less trouble. It is desirable, therefore, in all cases in which derangements of the digestive organs are pretty constant, to examine with care into the condition of the liver.

The symptom which, more than any other, is characteristic of liver derangement, is *jaundice ;* but it is true also, that some of the most incurable of liver diseases may exist from first to last without its presence, while, on the other hand, cases of intense jaundice may occur, in consequence of violent mental emotion, without there being any considerable alteration noticeable in the structure of the liver itself.

Pain in the region of the liver, increased by pressure, or by lying on either side, especially the right, pain in the right shoulder, and enlargement or irregular shape of the liver, as determined by feeling its margins through the walls of the abdomen, are all more definite evidences of its being diseased than are disturbances of the nervous system and of digestion.

Not an uncommon condition which is often attributed to "biliousness," is the effect of constipation. The blood becomes poisoned with the substances which should be cast out from the bowels, giving rise to feverishness, loss of appetite, bad breath, a "muddy" skin, bad taste in the mouth in the morning, diminished capacity for work, etc. All of these disappear after the action of one or two brisk purges, which are very likely to bring away bile in the movements ; but there is little ground for believing that arrest of function of the liver had much, if anything, to do with the trouble.

Jaundice.

This is not a disease in itself, but is due to the circulation in the blood of elements of the bile, which have been absorbed. The coloring matter of the bile penetrates all the tissues of the body, staining them various shades of color, from a faint yellow to a bronzed or greenish brown. The color is always most perceptible in the white of the eye, but is liable to be masked in the yellow light of lamps or gas.

In most cases of jaundice, the urine becomes yellow, the perspiration stains the linen of the same hue, and sometimes the saliva, tears, and milk are similarly affected. When the condition is owing to retention of bile in the gall-bladder, the fæces lose their natural color, becoming pale, clay-colored, or slate-

colored, hard or lumpy, and acquire a very offensive odor. At the same time, owing to the absence of bile in the intestines, the latter become sluggish in their contractions, and constipation results.

An intense and pernicious form of jaundice attends one of the diseases of the liver, known as "acute yellow atrophy," and is also seen occasionally, following intense passion, such as anger, jealousy, fear, etc.

During pregnancy, the displacement of the intestines by the large uterus, may cause pressure against the gall-duct, so as to obstruct the flow of bile, and so may tumors of other organs, or of the liver itself, produce over-filling of the gall-passages, and thus cause jaundice.

It is questionable whether the so-called jaundice, with which most babies are affected for a few days after birth, is really a staining of the tissues by bile, or a discoloration following the intense congestion of the skin during labor, and which, in a mild way, resembles a bruise of the entire surface of the body.

Usually, persons affected with jaundice are low-spirited and irritable, lose their appetite, and have a slower pulse than natural. Troublesome itching of the skin, without any apparent cause, is also sometimes noticed. A feeling of exhaustion, and inability to work, exists pretty constantly.

Unless the jaundice is caused by some incurable disease of the liver, or occurs in persons who are enfeebled by sickness or age, the prospects of recovery are favorable. An exception to this may be in cases where it follows mental shock.

Treatment.—Many cases of jaundice recover without any treatment whatever, after an interval of two to fourteen days. Others continue for a longer time, especially when due to disease of the liver. In the simpler form a brisk cathartic, like a tablespoonful or two of castor-oil; a tablespoonful of elixir of buckthorn; eight grains of rhubarb with twice as much powdered jalap and five grains of powdered ginger; or a tablespoonful of Epsom salt dissolved in a glass of warm water, will favor recovery.

When the gall-duct is obstructed by a gall-stone or plug of thickened bile, the jaundice will disappear when the obstacle to the flow of bile is removed. A remedy occasionally resorted to at such times is chloride of ammonium, in doses of twenty grains in water, every four hours. Nausea and vomiting may be controlled by abstinence from food for a few hours; the use of ice swallowed in small lumps; mustard plasters or hot poultices applied over the stomach; or milk and lime-water, in the proportion of one part of lime-water to two, three, or four parts of milk.

Improvement in the condition of the patient will be attended with lessening of the bile in the urine, and darkening of the color of the fæces, which, at the same time, become less firm in consistence and lose their unnatural odor. Owing to the slowness with which the coloring matter of the bile is absorbed from the tissues, the skin and whites of the eyes may continue stained for some days after the function of the liver is restored. Convalescence may be aided by the use of doses of two teaspoonfuls of tincture of gentian with a little cold water, taken before meals, and by restricting the diet for a few days to easily digestible food.

The jaundice caused by diseases of the liver require the services of a physician, and it is best to send for one in any case.

Gall-Stone—Biliary Colic.

When speaking of **Colic,** reference was made to the pain attending the passage of bile-gravel through the gall-duct. This trouble is not often met with before middle life, and is rather more frequent in women than men, and in those who take but little exercise. The gall-stone may be single, or there may be a large number of various sizes. In the latter case, they are apt to present flattened surfaces caused by wearing against each other. They vary in color according to the amount of bile-pigment contained in them, from nearly white to reddish-brown, dark brown, or black.

An attack of biliary colic is most apt to follow a meal or some unusual muscular effort. It commonly commences with a sense of discomfort at the pit of the stomach, which increases to pain of a steady character. At intervals the pain increases in severity, and then as gradually diminishes. Nearly always there are darting pains in the direction of the right shoulder. Nausea and vomiting come on, the fluids thrown up being sour. There is flatulence, and, it may be, some looseness of the bowels.

When the spasms of pain are at their height, they are intensely agonizing, sometimes so severe as to cause convulsions, and they leave the patient, in the intervals when less acute, with a cold, clammy skin, weak and slow pulse, and great prostration. When the gall-stone escapes from the gall-duct into the intestine, or drops back into the gall-bladder again, the relief is instantaneous, and all the trouble is soon over.

The attack may last for a few moments only, or, when the gall-stone is large, it may continue for many hours. When once a stone of considerable size has passed through the gall-duct, the

latter remains larger than before, and smaller masses may afterward escape without making trouble.

Treatment.—When the nature of the malady is recognized, it is well to send for a physician. In the meantime, take twenty drops of laudanum and a teaspoonful of the compound spirit of ether in a wineglassful of water, and repeat it in about an hour if the first dose does not suffice. If vomiting and retching are troublesome, an eighth of a grain of morphia may be taken dry on the tongue, and, if needful, may also be repeated *once* after an hour.

Pressure across the pit of the stomach often gives some relief, and still more may be derived from a hot poultice of flaxseed and mustard, strong enough to redden the skin. Chloroform applied to the pit of the stomach and covered with a folded napkin, towel, or a piece of oiled silk, is also of service.

If sulphuric ether is at hand, a teaspoonful may from time to time be poured into a folded napkin and held an inch or two above the mouth and nose, so as to be inhaled. It is not necessary to produce entire insensibility, but merely to "take the edge" off the suffering. No harm whatever can follow this mode of using ether, where the suffering is intense, and it serves to tide over the period occupied by the passage of the calculus.

Relief sometimes follows the taking of a hot bath, but ordinarily the sufferer is too restless to make it practicable.

For several days after a fit of gall-stone, the stools should be thoroughly mixed with water and passed through a sieve so as to secure the concretions that have given origin to the trouble. This is desirable on account of the knowledge derived respecting the probability of there being another attack—since the discovery of a calculus having smooth, flattened sides, is evidence that others have accompanied it, while a calculus which lacks such facets is probably the solitary cause of the trouble.

Gin-Drinker's Liver—Cirrhosis of the Liver.

This is not always to be traced to the use of alcoholic drinks, although this cause exists in the large majority of cases. Occasionally it affects young children and persons who have never been addicted to drinking, but it is mostly found among people who have been subjected to the privations of poverty, hard work, and depressing emotions, and who have been accustomed to the drinking of undiluted liquors. Although liquor in any form is liable to cause this trouble, it is particularly harmful if taken without water, and most persons suffer sooner or later from its habitual use in this

way. Certain persons who are especially susceptible to the effects of alcohol suffer derangements of the liver from drinking even the light wines, while others appear to be able to drink whiskey, brandy, gin, etc., with daily regularity, without such harmful results. Those of the latter class are few in number, however.

The Symptoms which characterize the early stage of the disease are not easily distinguished from those of ordinary indigestion, and are almost always overlooked. When, however, there is loss of flesh and strength, frequent loss of appetite, pain or discomfort on the right side about the region of the liver, with, perhaps, occasional pains about the right shoulder, some tenderness on pressure, and when the liver is found on examination to project below the margins of the lower ribs in front, in a person who is pretty regularly in the habit of drinking, there is little occasion for doubting the nature of the trouble, but it is hardly probable that abstinence from the use of liquor will now prevent the further progress of the disease.

A little later the material which has been deposited, and thus caused the general enlargement of the organ, begins to contract, and, in time, the whole liver commences to grow smaller, and have a lumpy form and an irregular margin, even when felt through the wall of the abdomen, and it is this condition which has given to it the name "hob-nail liver." This contraction leads to narrowing of the blood-vessels which pass through the gland, and so causes the veins coming from the other organs of the abdomen to be over-distended. Piles or hemorrhoids result, and give constant trouble. Indeed, they are so uniformly present as to lead physicians to suspect some such liver derangement when piles are persistently troublesome in persons past middle life. The fluid portion of the blood oozes through the walls of the intestinal veins and gives rise to dropsy of the belly. The veins of the stomach are over-filled with blood in consequence of the impediment offered to its passage through the vessels of the liver to reach the large vein of the trunk, and the mucous membrane of the stomach becomes, therefore, congested and inflamed. The patient grows irritable and dyspeptic, loses flesh and strength, has bleeding from the bowel; the accumulation of fluid in the belly increases and interferes with the action of the lungs, heart, kidneys, and other organs of the trunk, and, finally, the patient dies in a state of exhaustion, after suffering, perhaps, from an uncontrollable diarrhœa.

Treatment.—There is no cure for the trouble. When it is caused by the use of alcoholic drinks, these should be entirely stopped, and every means be taken—such as the improvement of

digestion, the use of nourishing food, and the provision of fresh air—to sustain the strength.

Anodynes, in some form, and under the advice of a physician, together with the wearing of flannel, the use of salt baths, and the application, to painful spots, of hot poultices, may serve to make the patient more comfortable.

There is another form of **Cirrhosis** or hardening of the liver, in which it becomes much enlarged, and does not afterwards contract in a manner to render its surface irregular, as in the affection just described. The cause of the disease is not well understood, but there is no evidence to show that it is caused by the use of alcohol.

Symptoms.—As in the foregoing malady, the early symptoms are obscure, dyspepsia, and loss of strength and flesh being also present. But, whereas in "hob-nail" liver, dropsy of the belly, diarrhœa, intestinal hemorrhage, and piles, are uniformly present in the advanced stages, in this form they rarely occur. Jaundice, however, occurs early, is very persistent, and, as a consequence, the person suffers from its poisonous effect upon the structure of the brain and nervous system.

Syphilis sometimes causes an overgrowth of the liver, which may resemble the foregoing in its early stage. In other cases, the deposits of unhealthy material are limited to isolated portions of the organ; in still others, the liver acquires an irregular form.

Congestion of the Liver.

This is sometimes caused by over-eating, conjoined with sedentary life and the use of stimulants; residence in a hot climate, and in malarious localities; certain fevers and inflammatory affections; but more often it is caused by diseases of the heart and lungs which obstruct the current of blood, and cause the vessels of the liver to be overfilled.

The symptoms are enlargement of the liver, pain and tenderness in the right side on pressure and while lying on either side, pain during a deep breath or coughing, and some shortness of breath when the enlargement is considerable. There is apt to be some jaundice. Late in the disease, if the congestion has led to inflammation, the liver contracts, and such symptoms follow as were noted when speaking of "gin-drinker's liver."

Abscesses may also form in the substance of the gland and be discharged through the lungs, stomach, into the belly, through the walls of the abdomen, etc., etc.

Treatment.—When caused by diseases of the heart or lungs, these must first be removed if possible. When due to climatic or

malarial causes, change of residence is requisite. When it follows improper modes of eating and drinking, the course to adopt will be evident. Temporary benefit will follow a dose of Rochelle or Epsom salt, but a physician should be consulted, owing to the probable dependence of the congestion upon lung or heart affections.

Waxy Liver.

This is a condition which often follows long-continued and exhausting discharges, such as diseases of the lungs, chronic dysentery, diseases of the bones and kidneys, chronic abscesses which keep up a constant discharge of matter, etc. The liver in such cases becomes enlarged and causes disturbance of the health. It is usually complicated with disease of the kidneys, and, owing to the nature of the original cause, is not likely to escape the attention of a medical adviser, whose services can hardly have been dispensed with in some stage or another of the trouble.

Fatty Liver, etc.

People who live well, and lead at the same time a sedentary life, sometimes acquire an enlargement of the liver due to a deposit of fat in its structure. This is by no means always the case, nor is the condition restricted to those who are high-livers and who indulge regularly in alcoholic drinks. In fact, in the majority of cases, perhaps, its fatty condition is not recognized during life unless it undergoes considerable enlargement. In cases of chronic lead-poisoning, in poisoning by phosphorus, and sometimes, during continued fevers, the liver becomes fatty, but the symptoms of the causative disease are the ones which attract most attention, and are the most amenable to treatment.

Besides the foregoing, there are derangements due to cancer, parasites, etc. Their consideration, however, can hardly be attempted with profit in a work of this character.

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Diseases of the Rectum and Anus.

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MALFORMATIONS AND DISEASES OF THE RECTUM AND ANUS.

ANATOMY.

The lowermost division of the intestinal canal is called the rectum. It occupies the cavity of the pelvis, being continuous with the *sigmoid flexure* * of the colon above, and ending below at the anus. The rectum is about ten inches in length, and is divided, for convenience of description, into three portions: the upper, five to six inches in length, covered outside by *peritoneum;* the middle, about three inches long, usually dilated into an ovoid pouch; and the lower, about an inch in length, which is constricted by the grasp of the sphincter muscle. Seen from the front, the course of the rectum is nearly straight, as its name implies; but in profile it presents three well-marked curves: the upper or peritoneal portion bends forward over the brim of the pelvis and then passes backwards, so that the second portion, or pouch, occupies the lower part of the concavity of the sacrum; the latter then curves forward along the coccyx below, and finally turns sharply backward, to end at the anus.

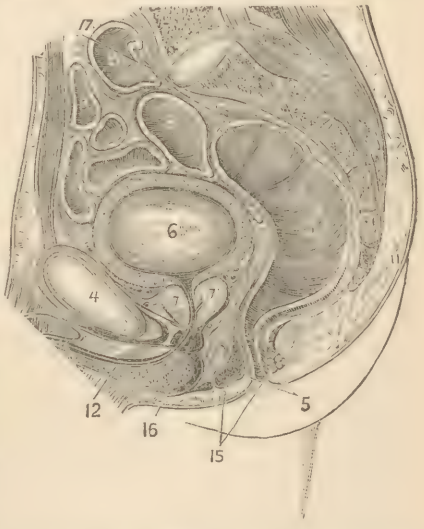

FIGURE 161.—Section from the front backward through the organs lying in the male pelvis: 1, The pouch or middle portion of the rectum; 2, the lower portion of the rectum; 4, the pubic bone; 5, the inner sphincter muscle; 6, the bladder; 7, the prostate; 8, portions of the large and small intestine which have been cut across in making the section; 10, the spinal canal; 11, the coccyx; 12, the urethra; 15, the outer sphincter muscle; 16, the membranous portion of the urethra; 17, the promontory of the sacrum.

The walls of the rectum consist mainly of strong muscular fibres, in two layers: the outer running in the direction of the length of the bowel, whilst the inner layer encircles it, and, tow-

* Shaped like the Greek letter ς (*sigma*).

ards the anus, grows thicker and stronger, so as to form what is called the "internal sphincter." Invested with peritoneum externally on its upper two-thirds, its longitudinal muscular fibres are bare below. Within the bowel, its mucous membrane, which seems too long for the other coats, and is consequently thrown into transverse folds which tend to obstruct the passage of instruments through the cavity, is attached to the internal or circular muscular fibres by a loose but strong layer of fibrous tissue. This latter is extensible, for, in *prolapse*, the lower portion of the mucous membrane is dragged away from the muscular coat and protruded, alone, through the orifice of the anus.

The mucous membrane of the rectum is studded with numerous minute glands, which furnish a quantity of thick, ropy mucus for its lubrication and protection; the necessity for this constant and large supply of mucus accounts for the size and number of blood-vessels, especially at the lower end of the gut.

In front, the peritoneal portion of the rectum is in relation, in the male, with the bladder, and its pouch is closely connected with the prostate and urethra; in the female, the rectum is in relation with the uterus above, and the vagina below, a fold of peritoneum separating them. This latter relation is important, for *displacement* of the uterus may obstruct the rectum. Behind, the rectum, throughout its course, is in relation with the bony walls of the pelvis.

The pouch of the rectum varies in its capacity; it is increased by overdistention from neglect of the calls of nature. A small hand can be introduced safely through the sphincter and along the rectum, even beyond its upper limit, where its diameter is less than in the pouch. This measure has been found useful in detecting disease. The rectum usually contains some fæces, but it is improperly regarded as a reservoir. Its function is to receive and extrude fæcal matters; hence the increase of muscular fibres in its walls, and the provision for lubrication. Moderate distention of the rectum provokes the desire to expel its contents, and this natural call should not be habitually ignored. The nerves of the rectum, and especially of the anus, are very numerous, hence the exquisite sensibility of these parts.

MALFORMATIONS OF THE ANUS AND RECTUM.

Although rare in the experience of individuals, the aggregate number of infants annually born with these deformities is large; and of this number a majority are relievable by the resources of art. Such cases very frequently pass unrecognized, until it is too

late for successful operation, and they are too often regarded as hopeless, and allowed to die, when, in fact, skilful surgery could save them.

Of the almost endless variety of congenital malformations the following are the principal :

A child may be born with *partial closure*, or simple narrowing of the orifice of the anus, to such a degree that it will hardly admit a probe or bodkin. This deformity is not immediately mortal ; it causes gradual distention of the rectal pouch, with great difficulty in defecation, and grave consequences sooner or later. It should be entirely and permanently relieved by an operation.

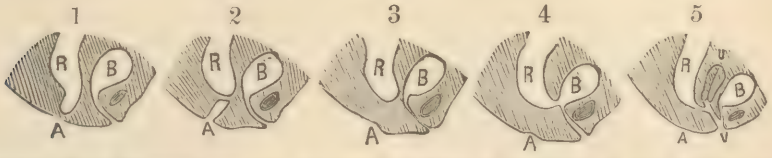

FIGURE 162.—Malformations. A, the usual position of the anus; B, the bladder; R, the rectum ; U, the uterus ; V, the vagina.

In 1 a thin membrane closes the opening of the anus. In the next instance (2) the partition is higher up and apparent, only, on careful examination. In 3 no attempt has been made on the part of nature to form an anal opening. In 4 the rectum opens into the bladder, and in 5 the vagina communicates with the rectal pouch.

In *complete imperforation* there is often entire absence of any trace of an opening, or there may be a dimple or minute depression marking the spot, or the boundaries of the natural opening may be covered in by a film of skin of more or less density. The latter is the most common of all these deformities, and it is always promptly relievable.

When the anus is entirely wanting, the rectum may lie just beneath the skin, so as to be reached at once by an incision, or it may terminate higher up, at a distance of half an inch to two inches, or so high as to be entirely out of reach ; or, in a certain proportion of cases, the rectum ends by a narrow opening into the bladder, or vagina.

Symptoms.—An infant born with occlusion of the rectum soon becomes fretful, refuses the breast, and looks pinched ; there is absence of stools, gradual distention of the abdomen with difficult breathing, and a short peculiar cry, great restlessness and general distress, with colicky pains, vomiting, and sometimes convulsions. When unrelieved by a surgical operation, death generally occurs within ten days, from peritonitis, sometimes preceded by actual rupture of the large intestine. Where there is an escape of meconium with the urine, or from the vagina, a fatal result is deferred, in rare instances indefinitely ; but such cases have been

remedied by art, and nothing is to be expected from the efforts of nature.

Treatment.—Whenever a new-born infant goes over the first day without a natural passage, the fundament should be carefully scrutinized in search of a possible malformation. Even when the opening is perfectly natural in appearance, the little finger should be well greased and inserted to feel if the passage is free internally, for there may be entire occlusion within an inch; in case of doubt, surgical aid should be sought at once, for delay rapidly diminishes the chances of successful interference. The object of an operation in these malformations should be not only to give relief at the moment, but to secure permanent use of the part. Puncture by a trocar may secure a full escape of fæces, but afterwards, except in the simplest cases, constant effort will be required to keep the artificial passage open. Advancing surgery discards the trocar in these cases, except for exploration, and strives for permanent establishment of function; where there is deficiency in the rectum this can only be accomplished by bringing what there is of the gut down and attaching it to the margins of the new opening. When the bowel cannot be thus reached and brought down, there is still a possibility of relief by making an opening in the abdomen, or in the loins. A woman reached the age of forty-nine whose abdomen was thus opened shortly after birth.

DISEASES OF THE ANUS AND RECTUM.

These affections are exceedingly common, and, although but few of them are dangerous to life, they are remarkable for the extreme pain which they are capable of producing. For reasons not creditable to either patient or physician, they receive less attention than other maladies, and this is to be regretted, for there are no diseases which, as a class, are so promptly and certainly remediable by art.

Painful Itching of the Anus.

This distressing and often obstinate affection is, in most instances, the local expression of some general disorder of the system, but occasionally it arises from causes which are entirely local. It is usually worse at night. The anus often presents a water-soaked appearance, with evidences of violence from scratching.

Causes.—Derangement or failure of nerve-force; the gouty diathesis, in which the perspiration is acid and irritating; high living, with immoderate use of strong drink, tea, coffee, or tobacco; over-

work, and anxiety of mind ; too sedentary habits ; salt-rheum and other eruptions ; piles ; fistula ; thread-worms ; a parasitic vegetable growth.

Treatment.—This depends upon the cause of the affection, which must be ascertained. In the sedentary and high-livers, exercise and abstinence are necessary remedies. In the gouty and costive, the laxative salts of magnesia and soda, Pullna water, colchicum. In the weak and nervous, cod-liver oil, arsenic, quinine. Locally, for thread-worms, injections of lime-water, diluted tincture of iron, decoction of pink-root. For an eruption with a curved and well-defined margin, indicating a parasitic growth, sulphur ointment with chloroform. Where there are abrasions, benzoated zinc ointment, with or without chloroform. For eczema or salt-rheum, add calomel to the preceding, or apply yellow-wash. An application of tincture of iodine, diluted at first, before going to bed. Wearing a wad of prepared oakum pressed well against or into the anus. Daily washing with soap, and subsequent application of alcohol in some form, to harden the part.

Hemorrhoids or Piles

Are the most common disease of this region. They are small, rounded tumors, generally of a red or purplish color, which form either just without or just within the orifice of the anus ; hence the distinction into *external* and *internal* piles. They take their origin in overdistended and varicose blood-vessels, principally veins, modified by the mechanical violence to which their position exposes them.

Causes.—Hereditary tendency ; neglect of regularity in attending to the calls of nature ; straining, and sitting too long at stool ; sedentary habits and high living ; obstruction to the venous circulation within the abdomen, as by pregnancy or tumors.

Symptoms.—An *external* pile is first recognized as a little painful excrescence at the margin of the anus, which usually subsides after a few days, leaving a shrivelled flap of integument, which is permanent ; or, it may go on to suppuration, and if not opened early, there is a possibility of fistula.

Internal piles are liable to bleed at stool, and, as they grow, are extruded during defecation, and drag down with them the mucous membrane to which they are attached. At first they go back into the bowel spontaneously after the stool, but as they increase in size it becomes necessary to put them back. In advanced cases they come down at other times than at stool, and, if there is delay in returning them, they become engorged and excessively tender

in consequence of prolonged strangulation by the sphincter, so that they cannot be put back, in which case they are liable to slough. The danger of this occurrence, and the injury to the general health by the constant loss of blood, and inability for active exercise which the disease entails, necessitate treatment for its radical cure. In many cases the loss of blood is excessive, and it may take place so insidiously as to affect the patient's complexion, as a consequence of actual bloodlessness, before its existence is suspected.

Treatment.—For *external* piles, rest and cold ; or, greasy applications to prevent friction, preferably Goulard's cerate, which is also sedative and astringent, together with means to secure easy defecation, of which the most certain is to inject from half a pint to a pint of tepid water into the bowel just before the act. If the pain is very acute and persistent, a poultice with laudanum may be tried ; and, finally, an incision may be necessary.

For *internal* piles, the safest and surest remedy is the application of a ligature to each tumor, by an expert ; this is best done under the influence of ether, and at one operation, which, if properly managed, will be free from serious pain. Nitric acid is only a palliative of limited application, and, unless used with great care, may cause stricture. The actual cautery, which has been highly praised, is liable to be followed by hemorrhage as well as stricture.

The sudden stoppage of a hemorrhoidal flux is popularly assumed to be attended by some danger. In a long experience the writer has seen nothing to warrant this apprehension, and he believes it to be unfounded ; he knows of no operation in surgery more uniformly satisfactory in its results, and more certainly followed by improved health, than the ligature for internal piles. As a preventive of increase, and a palliative where a radical cure cannot be attempted, the daily use of an enema of tepid water before stool, and the injection of a gill of cold water immediately afterwards, with cold douche to the anus, when feasible, are the most useful means, together with attention to diet, and avoidance of the causes of the disease already mentioned.

Fissure of the Anus.

This is the name usually applied to a small ulcer, long and narrow in shape, situated just within the orifice of the anus in a cleft between two of the wrinkles into which the membrane lining this portion of the rectum is thrown by the constriction of the sphincter muscle. The little ulcer is, therefore, entirely within the grasp of

the muscle, and this circumstance accounts for its characteristic features, viz., the peculiar and intolerable pain which always accompanies it. The lesion itself is insignificant, but its unfortunate position subjects it to the unceasing action of the bundles of fibres which compose the sphincter, and this, in the first place, prevents it from healing, and afterwards keeps it in a condition of painful irritability by incessant pinching. This affection is known, also, as the "irritable ulcer of the anus."

Symptoms.—The pain of fissure is not very considerable at the moment of defecation—in fact, it is sometimes hardly noticeable; but, after a short interval, it commences with a smarting, teasing sensation, remarkable for its unremitting persistence, and which sufferers describe as harder to bear than much more severe pain. After a variable period it ceases, but only to be renewed with inevitable certainty the next time the bowels act. To avoid its recurrence patients defer their stools, often habitually, and, in consequence of this irregularity, and the use of anodynes to control the pain, the complexion becomes sallow, the expression unhappy, and the general health suffers. It is not a matter of surprise, then, that this malady, so trifling in extent, should have been mistaken for cancer. The disease may be recognized by the symptoms just detailed; but, by inspection of the anus in a good light, on carefully pulling apart its margins and unfolding the wrinkles, the lower end of an angry-looking sore, with elevated edges—an unhealthy, irritable ulcer, in short, is brought into view.

Causes.—In the act of straining to extrude a hard stool, the thin integument at the anus is cracked or fissured, and healing being prevented by the constant motion and mechanical violence to which it is subjected, the lesion gradually takes on the character of an irritable ulcer. The presence of internal piles favors the occurrence of fissure, and the two diseases are frequently associated. Any wound of this part, if its healing is delayed, may assume the characteristics of "fissure."

Treatment.—Any measure capable of arresting the action of that portion of the sphincter muscle in immediate contact with the little ulcer, for four or five days, will at once stop the pain in this disease and bring about a cure. The ulcer assumes a healthy character as soon as it is placed at rest, and it forthwith begins to heal. Boyer, who first discovered this fact, divided the whole muscle by the knife; Copeland found that division of the ulcer itself, and of the muscular fibres immediately beneath it, was sufficient; and it has since been fully demonstrated that gentle stretching of the anus, so as to produce a condition of temporary atony of the sphincter, if thoroughly and properly done, will cure the

affection at once, without confining the patient to the bed. No other remedies possess any value. Infants, who are very liable to fissure, usually get well promptly by the use of zinc ointment alone, and securing soft stools; and the same result may be attained in the adult, if the remedies are applied promptly on the occurrence of the lesion. Where ocular inspection has been neglected, this readily curable disease has been often treated for a long time, unsuccessfully, under the vague name of "neuralgia," or of "spasm of the sphincter."

Ulcer of the Rectum.

The disease last described, although strictly an ulcer of the rectum, owes its characteristic features entirely to the spasmodic action it provokes in the sphincter muscle, in contact with which it is situated. In the disease now in question, the ulceration is seated higher up in the bowel, out of the reach of the sphincter, but usually within three or four inches of the anus, and it gives rise to symptoms which are readily distinguished from those of fissure.

Symptoms.—Ulcer of the rectum occurs mainly in middle life; it sometimes gives little evidence of its presence, but generally causes more or less uneasiness in the rectum, with desire for stool, especially in the morning, after rising from the recumbent position—what has been called "morning diarrhœa"—the dejections showing streaks of blood, or pus, or a material like coffee-grounds, which is rectal mucus mixed with blood. Pain may also be referred to the back between the hips, sometimes extending down the thighs; and there is, usually, more or less desire to strain at stool.

In consequence of its exposure to the contact of irritating fæces, and of constant lack of rest, ulceration in the rectum tends to persist and to increase; and it is noticeably slow in healing under treatment. Perforation of the coats of the bowel is liable to take place, giving rise to escape of fæces and consequent abscess and fistula. Or, the ulceration extending around and involving more or less of the circumference of the mucous membrane of the bowel, when there is an effort at healing, it produces thickening and puckering, by contraction, resulting in stricture. Besides the liability to these complications, persistent ulceration of the rectum is usually accompanied by loss of flesh and failure in the general health.

Causes.—Ulcer of the rectum may follow abrasion from contact of hard fæces, or of some rough foreign substance which has been swallowed, or it may come from a wound or laceration re-

ceived in some other way. It may be left behind after a dysentery, may take its origin in tubercular deposit in the rectal glands, or in a tendency to ulceration from a vice in the system, such as scrofula, or syphilis, or it may result from the contact of other local poison.

Treatment.—When the symptoms above detailed are present, an exploration of the rectum should be made, preferably under the influence of ether, as the only sure mode of determining the exact seat and character of the ulceration; this may show the necessity of a local application, as of caustic, to alter the character of the sore and make it heal. Local applications, however, are painful and difficult to make, and alone are rarely effective. The best medical treatment is as follows: a full dose of castor oil to clear out the bowel entirely, and then the recumbent position rigidly persevered in for a month at least, with a diet confined absolutely to unskimmed milk, of which from two to three quarts may be taken, by an adult, daily. The milk may be coagulated by rennet. When the general condition is poor, koumyss, or cod-liver oil may be added. If at the end of six weeks an examination shows that the ulcer is not healed, or rapidly healing, experience has proved that division of the ulcer and the sphincter at the same time will be necessary.

Stricture of the Rectum.

In its simple or benign form,* stricture of the rectum is a rather rare disease. It consists in a narrowing or constriction of the calibre of the bowel, so as to obstruct the passage of it contents. It is almost always situated within three and a half or four inches from the opening of the anus, and in the great majority of cases even nearer, and therefore within reach of the finger. In the very rare instances in which an ordinary stricture forms so high up the bowel as to be beyond the touch, its presence can only be ascertained with certainty by the fullest exploration under ether, by an expert, with all the most recent means at hand to insure success. Exploration by bougies, however perfectly constructed, or by tubes, even aided by simultaneous injection with water, cannot be relied upon with absolute certainty; the contact of the advancing extremity of the instrument with the transverse folds of the gut, or with the projection of the sacrum, has constantly deceived even experienced physicians; and, strange to say, the majority of

* These terms are used to distinguish simple stricture from cancerous disease, which in this locality is also attended by narrowing and obstruction of the bowel.

cases of so-called strictures of the rectum beyond the reach of the finger are purely imaginary, the symptoms of stricture being simulated by certain not uncommon forms of constipation.

Symptoms.—A necessity for straining, in order to extrude the contents of the rectum, even when of moderately soft consistence—(this symptom is also present where the walls of the bowel have lost their contractile power) ; the habitual presence of wind in the large intestine, which rolls from one part of the bowel to another in unsuccessful efforts to escape externally, with frequent colicky pain, and more or less constant general distress ; the alternation of periods of costiveness with looseness of the bowels, large quantities of semi-liquid material being voided during the latter ; the duration of the periods of costiveness steadily increasing. The narrow, tape-like form of solid matter passed at stool is a symptom of little value, for this shape must come from the orifice of the anus—unless, indeed, the stricture itself is forcibly protruded through the anal orifice by straining during defecation, and thus gives its impress to the matters extruded—and this not unfrequently happens ; but in this case the stricture can be pretty certainly felt by the finger. A stricture beyond the reach of the finger could not cause tape-like stools, unless complicated with *invagination.*

Causes.—Previous ulceration, which in healing has been attended by contraction ; continued mechanical bruising — as by hardened fæces, long retained, or by the child's head in the act of parturition ; congenital malformation, in which the rectum remained *pervious*, but undeveloped to its full proportions.

Treatment.—The only method that promises a permanently satisfactory result is an operation by which a complete linear division of the strictured portion of the gut is effected in the direction of its length, including the sphincter and the intervening portion of the bowel. With proper management afterwards in the way of dilatation during the healing of the wound, this operation will limit the tendency to contraction, and confer permanent relief. When this cannot be done, the stricture may be nicked by the knife and rectum bougies systematically introduced, in the hope of securing dilatation ; or bougies may be used without any previous cutting, beginning with the size that will pass through the stricture and following it, if the parts are not too tender, at once, or if much pain is produced, on the next day, by the instrument of next larger size. If a dilating bougie is left in a stricture more than five or ten minutes, it is liable to cause irritation, and to be followed by an increase of thickening of the substance of the stricture. Force should never be employed in introducing

rectum bougies, as fatal results have followed. Dilatation cannot be relied upon to effect a cure of stricture. Judiciously employed, it may palliate indefinitely, but if the regular use of the dilating instrument is suspended, recontraction will inevitably recur.

Fistula in Ano.

After piles, fistula is the most common disease of this region. It consists in the presence of an unnatural track of the nature of a hollow, tubular ulcer, with an outer opening near the anus, and, generally, an inner opening which communicates with the rectum at a point just within its orifice. The fistulous track may be single, and lie immediately beneath the integument; or, its outer opening may be distant from the anus, sometimes several inches, and the track crooked, or branched, and communicating, possibly, with the cavities of unhealed abscesses, in which case there may be several external openings. Fistula in ano very rarely gets well spontaneously; its general tendency is to increase in extent by thickening of surrounding parts, or by forming new abscesses with additional openings, and to continue indefinitely. Besides the pain and annoyance which it causes, the disease is damaging to the system by the wasting discharge which attends it, and the arrest of this unnatural discharge is always an advantage to the patient. The popular idea that cutting off the discharge of a fistula in a person with "weak lungs" aggravates the phthisical tendency, is not in accordance with modern experience. On the contrary, it removes a source of waste, and an impediment to exercise and out-door life. A fistula may have continued many years, and yet be safely cured.

Symptoms.—A sense of uneasiness, itching, and not unfrequently pain, at the lower end of the bowel, with a more or less constant moisture, which generally soils the clothing, and is sometimes offensive in odor through admixture of material which has entered the fistula from the bowel. Now and then gas from the bowel also escapes externally through the fistula. Temporary closure of the external opening, with arrest of discharge, followed afterwards by increased pain and re-ulceration, destroying the hope that had arisen of spontaneous cure, constitute a not unfrequent group of symptoms in fistula. Sometimes a new abscess forms, attended by greater swelling and pain. The discharge of a fistula often provokes irritation and soreness of the skin around its outer opening; this is liable to be increased, especially in hot weather, by the dressings which it is necessary to employ for the sake of cleanliness. In women, fistula sometimes escapes detection when the

outer opening is very minute, which is often the case, the slight discharge being ascribed to leucorrhœa. There is a variety of fistula known as "blind internal," in which the outer opening is wanting, and a painful lump exists in its place.

Causes.—Fistula always takes its origin in abscess which has formed near the lower end of the bowel, and which, in this locality, failing, as a rule, to heal entirely, shrinks down to the dimensions of a hollow canal, and persists indefinitely. An abscess may possibly form in such a slow and painless manner as to escape notice, the subsequent discharge being the first symptom to attract attention. There is generally, however, a lump recognized beforehand, and in most cases this becomes hot and tender, often excessively painful before it discharges. [See **Abscess.**]

Treatment.—Fistula may be palliated in some degree by frequently bathing the part in cold water, by strict attention to cleanliness, and by using as light dressing as possible to receive the discharge. An excellent material for dressing is prepared oakum, which usually remains in place, in consequence of its adhesiveness, without any retentive bandage; or a piece of fine sponge squeezed out of a very weak solution of permanganate of potash and kept in contact with the anus by forcing the buttocks together and retaining them in contact by a broad, transverse strip of adhesive plaster.

A radical cure is most certainly secured by a surgical operation in which the fistulous track is incised throughout its entire length; the lost tendency to heal is thus renewed in full force, and the fibres of the sphincter muscle which kept the part in constant motion being placed at rest, the wound heals forthwith, soundly, from its deepest portions. Since the American discovery of ether, by which it is rendered entirely painless—and this is a sensible resource, and perfectly safe in competent hands—there is very little to be desired in the way of entire efficiency for this operation. There is no danger from hemorrhage, and the subsequent dressings, in the improved practice of the present day, are light, painless, and not very frequent. The condition of health of the patient should be determined beforehand, by careful examination of the internal organs, to ascertain if there be sufficient vital force to heal the wound made in operating. The ability to digest food, and to increase in weight under tonic treatment and appropriate diet, will determine this question in doubtful cases. Whilst there is no remedy so rapid and sure, and at the same time so safe as the knife in the hands of a skilful surgeon, there are substitutes for it which might be employed for patients with a natural tendency to bleed too freely (subjects of the hemorrhagic

diathesis), or whose aversion to the knife is excessive. Of these, the elastic ligature inserted through the fistula and tied tightly enough to cut its way out, is, perhaps, the best; and injection of strong tincture of iodine has some advocates. Both are more tedious and painful than the regular operation, and are liable to provoke abscess. The *écraseur** has also its advocates. In bad cases of fistula, a second or even a third operation may be required to accomplish a cure, safely, without too free incision. The healing of the wound when slow, is hastened by change of air, or a sea-voyage.

Abscess Near the Anus or Rectum.

Abscesses in this region are of frequent occurrence. They have this peculiarity, that, as a rule, they refuse to heal, and gradually assume the characteristics of fistula. This tendency to assume the form of a chronic disease instead of getting well, like most abscesses in other localities, has suggested much inquiry as to its cause, in the hope of discovering the means of preventing fistula. In some instances these abscesses assume an extent and a degree of gravity leading to a destruction of parts around the lower end of the rectum, which is beyond the power of nature to repair, and may involve life.

Symptoms.—Abscess presents itself in different forms, according to its cause, its size, and exact position. A very common form is that of a minute globular tumor, situated just at the margin of the anus, and remarkable for its excessive painfulness, which is due to the fact that it is within the grasp of the sphincter muscle. It may last five or six days, and in exceptional instances only, may subside without suppurating. An abscess arising farther from the anal margin, although out of the grasp of the sphincter, is nevertheless liable to be attended by great pain and some degree of feverish reaction, and to continue for some days longer. It always suppurates. A third variety takes its origin more deeply in the fat alongside of the rectum, and is slow in coming to the surface; occasionally it assumes a spreading character like the more serious forms of erysipelas, is attended by a low form of fever, and requires prompt surgical interference to prevent serious consequences. Slowly-growing, indolent abscesses not unfrequently form with little or no pain, and even ulcerate and discharge, in

* An instrument in which a loop of wire or smooth-jointed chain is gradually tightened by means of a screw and nut, so as to crush through the soft parts inclosed within it.

some instances without the patient's knowledge; but they almost always leave fistulæ.

Causes.—Piles, both external and internal, which have become the seat of irritation; straining at stool to void hard fæcal matter; ulcer of the rectum, from whatever cause, which may perforate the wall of the bowel and permit escape of its contents. A temporary derangement of health in sedentary persons, especially if high livers, often culminates in a rectal abscess; and, in emaciation complicated by a bad cough, the lack of support to the lower rectum of the usual fatty cushion, often leads to rupture of the isolated veins, and consequent abscess.

Treatment.—In case of a lump near the anus, painful or otherwise, which threatens to culminate as an abscess, there is little use in seeking for remedies to put it back, for the simple reason that suppuration is the almost inevitable rule. The speediest relief is to be got from means employed to hasten this result; and it is undoubtedly the best course to take ether, and submit to an incision without delay, which will arrest the morbid process at once, by giving free issue to pus which has formed, or to the foreign matter which is provoking the effort at pus-formation. After this, a poultice or a moist sponge to the part, and absolute rest until the wound heals, will be most likely to prevent the formation of a fistula. If the operation is preceded by a dose of castor oil, the bowels can be kept at rest, after it, with propriety, for a few days, and the result rendered more certain. When this course is not adopted, rest, as perfect as possible, with a pig's bladder two-thirds full of finely cracked ice, and accurately moulded to the part, may prevent a painful external pile from suppurating, and, in any event, is an excellent remedy for the pain, which is often excruciating. A warm poultice, with laudanum, stands next in order, and ointments of stramonium, or belladonna, may be applied directly to the part. The use of opium internally is liable to render the stools hard, and to produce flatulence. If employed at all, it should be given in combination with castor oil.

Polypus.

This name belongs to a class of tumors which grow from the inner surface of cavities lined by mucous membrane. They are small in size, globular in shape, and composed of one of the simpler tissues of the body; in some cases hard, but most frequently softish in consistence, they always tend to protrude themselves into the cavity, from the walls of which they grow by forming a neck or pedicle which gradually becomes more slender as it increases in

length; hence, when fully formed, a polypus is pear-shaped, and attached by its stem. In the rectum the point of attachment of a polypus is almost always within a few inches from the lower end of the bowel, and the tendency of its pedicle to elongate is aided by the action of the muscular coat of the gut in extruding its contents. Thus it happens that sooner or later the little tumor escapes with the contents of the bowel at stool, usually returning at first spontaneously, but after a time requiring to be put back. Polypus of the rectum is not a common disease; it occurs most frequently in children, but also in adults and occasionally even in old age.

Symptoms.—This disease presents itself as a smooth, rounded tumor of a scarlet color, which protrudes from the anus, accompanied by pain, and a desire to strain, and also by escape of blood. In a child the occurrence of the latter symptoms leads to an examination of the part; as soon as the crying and straining are controlled, the polypus usually returns again within the cavity of the bowel, or can be put back with very slight pressure. In an adult such a protrusion at stool is usually mistaken for an internal hemorrhoid; but it is, as a rule, harder to the touch, and more uniformly smooth of surface, than an internal pile, and a polypus is almost always solitary.

The constant recurrence of these symptoms with each movement of the bowels, especially the loss of blood, which is badly borne by children, renders a prompt cure necessary.

Causes.—As is the case with all tumors, the cause of a polypus growth in the rectum is obscure; and there are, consequently, no rational means of prevention to suggest.

Treatment.—A simple surgical operation will cure the disease promptly, and it rarely, if ever, returns. If, when the tumor is down, a sufficiently strong ligature of twisted silk, or hempen thread, be tied very tightly around its pedicle, the polypus will turn dark in color, die, and separate, spontaneously, in from one to three days, according to its size; the ligature will also take care of itself, and the pedicle will shrink away and disappear. The pedicle of a polypus consists of mucous membrane and the blood-vessels which nourish it; it must, therefore, be tied tightly enough to arrest completely the circulation in these vessels. If it were to be cut instead of tied, bleeding might follow.

Tumors of a more serious nature sometimes show themselves first in the form of simple polypi.

Falling of the Bowel.

The terms *prolapse* and *procidentia* are applied to a protrusion from the anus of the mucous coat of the bowel. Its mucous mem-

brane is the longest of the coats which form the walls of the rectum, and therefore, when the cavity of the gut is empty, its mucous lining lies in folds. It is also somewhat loosely attached to the middle or muscular coat by fibrous tissue, which is readily elongated. It is easy to understand, then, how it may be carried along with a costive passage, and dragged upon, so as to be protruded externally. This accident is especially liable to happen to young children, who strain violently and recklessly, and who are often left sitting for a long time upon the chamber, and to old people, in whom the fæcal matter is often dry and hard, and the mucous secretion deficient. Such a protrusion presents the appearance of a soft, scarlet-colored mass, with a number of deep transverse folds on its surface. It usually retires of itself, or may be readily pushed back. In a person of middle age, with internal piles, the tumors which grow from this part of the mucous membrane, assist greatly by their presence and bulk in provoking its prolapse, for they stand in the way of the fæcal mass, and in the act of defecation are pushed out before it. Hence such a protrusion consists largely of prolapsed mucous membrane of the gut, but the livid and patchy looking piles can be readily distinguished on inspection from the smoother and more uniform mucous membrane. The causes and symptoms of this simple malady are thus plain, and its treatment is equally so, but it should consist mainly in prevention. If the protrusion should resist gentle efforts to push it back by the fingers, aided by a greased rag, in the horizontal position of the body, or with the hips elevated, then surgical aid should be secured. In a young child a tendency to protrusion must be promptly met, or the reckless straining which is so hard to control in infancy will bring on a more serious affection—*procidentia*, or falling of the whole bowel. The two conditions are thus distinguished : in the milder form (prolapse) the mucous lining membrane only, forms the protrusion ; whilst in the more serious form (procidentia) the whole gut doubles upon itself and is forced outside to a greater or less extent. Except by the greater bulk and firmness of the latter and its usually occurring suddenly, like a rupture, it is not easy to distinguish the two affections ; their mode of production is very similar, and they are generally treated under the same head. A procidentia of the rectum sometimes attains a very large size when neglected.

Treatment.—A change of diet or other means to secure soft passages, and compelling the child to defecate in the horizontal position, with a diaper or a thin-edged bed-pan beneath the buttocks, assisting the act, if necessary, by an injection of warm milk and water, will certainly prevent any protrusion. If a child can

be made to defecate in the upright position, in a bath, with the lower limbs slightly straddled, or if, whilst half squatting, the mother will drag the orifice of the anus a little out of position—say to one side, by the hand upon the buttock, the protrusion cannot take place. If thus prevented for a few days, the parts will recover from their stretching, and the tendency to recurrence will be cured. But the squatting position, and sitting long at stool, are powerful provocatives. In weak-minded children the difficulty in effecting a cure is sometimes insuperable, and the protrusion becomes chronic, and its surface ulcerated; but even in the most aggravated cases there are surgical operations which are both safe and effectual.

Cancer of the Rectum.

This is happily a rare disease, for which many other affections of this region are liable to be mistaken. It is a painful malady, which usually terminates life, but modern surgery has made great advances by which its pain is alleviated, and in some instances life has been saved, in others prolonged for many years. Cancer in this locality is thought to be less malignant, and consequently more likely to be cured by an early and thorough operation, than when developed elsewhere.

Symptoms.—A dull wearing pain between the hips and in the lower bowel, with frequent desire for relief by stool; pain, and, generally, difficulty, in the act, with strong tendency to strain, and a discharge of coffee-colored mucus. Later, costiveness, sometimes amounting to entire obstruction, with alternations of diarrhœa; distress and colicky pain of the abdomen; a sallow complexion, failure of strength—more rapidly through loss of blood—and going on, finally, to fatal exhaustion. In rare cases pain is absent. In a certain proportion, the disease involves the anus, and is to be seen externally. The disease is liable to complications; in some instances by abscess and fistula; in others, by incontinence of fæces; in men by troubles on the part of the bladder, and in women by ulceration into, and discharge of fæces through, the vagina.

Causes.—The causes of cancer of the rectum are obscure. Long continued rectal ailments of a minor sort have been supposed to induce it; and hereditary tendency is often suspected.

Treatment.—Early and entire removal, when feasible—an operation which modern surgery has succeeded in safely accomplishing—affords the only chance of radical cure, and it offers, in most cases, a fair prospect of benefit. But the disease must be detected, and the operation undertaken, early. When it is too late for treat-

ment in this way, great, and generally certain, relief from the daily distress and difficulty in securing evacuations, is to be had by establishing an artificial outlet, which accumulating experience has demonstrated to be undeserving of the prejudice heretofore entertained against it. Years of comparatively comfortable life, with ability to attend to business in some instances, have been attained by a resort, for this purpose, to an operation which, in itself, is not attended by serious danger. Amongst other palliative measures, the most important are: The use of concentrated nutritive materials for food, those which leave the least fæcal residuum; occupying the horizontal position as much as possible, with the hips raised; having the stools only in the horizontal position, by which the straining and loss of blood are both materially lessened; the free use of tepid water, milk and water, and of mucilaginous or oily injections, to facilitate the escape of fæcal matters, and, subsequently, of anodyne injections and suppositories; prepared oakum to the anus to prevent involuntary escape of discharge, or of fæces; deodorizers, of which a weak solution of permanganate of potash is the best; cleanliness and protectives to prevent soreness of the skin near the anus; and, finally, opium. Sometimes the use of a rectum bougie, or of the finger, may possibly aid in palliating the obstruction so often present, but great care is necessary, inasmuch as fatal injury has been done in this way.

Impaction of Fæces.

This condition occurs in old age, in paralytics, and in women who, through sedentary habits and neglect of the calls of nature, have allowed the pouch of the rectum to become habitually overdistended, and thus to lose its natural sensibility and, finally, its contractile power.

Symptoms.—Uneasiness in the lower bowel and desire to defecate, with inability to extrude the contents of the rectum, which the sufferer recognizes is distended, for he can often touch a hard, dry fæcal mass with the finger; in some cases there is diarrhœa.

Causes.—In addition to those stated above, there is frequently a deficiency of rectal mucus—the natural lubricating material. Certain kinds of food seem to promote this condition.

Treatment.—Strong cathartics are injudicious; they cannot break up the impacted mass, and may excite violent straining, which is to be avoided, for it has caused laceration and rupture. If castor oil in moderate doses has failed, resort must be had to manual interference by means of a strong iron spoon-handle, an

instrument for injection, and a good supply of warm flaxseed tea and oil, with which, by patient perseverance and repeated washings out, the mass may be gradually broken down and got away. It may be necessary to gently dilate the sphincter. To prevent recurrence, the best means are the use of bran, or crushed wheat as food, or of an aloetic dinner-pill, or a daily injection of tepid water, with out-door life.

Foreign Bodies in the Rectum.

Under this head are included concretions which have formed in the bowels and which sometimes reach an almost stony hardness, indigestible substances which have been accidentally swallowed—as in the case of the lady who bolted her false teeth—and articles introduced from without—as in the case of the old gentleman who was in the habit of sitting upon a cone-shaped cobble-stone after stool, to press back a large protrusion of internal piles and prolapse, and one day the stone slipped through the over-stretched sphincter into the bowel, from which it was removed by the late Dr. Valentine Mott with obstetrical forceps.

The **Symptoms** caused by a foreign mass in the lower bowel are the same as those described under the last head. Where it has a rough or angular surface there is more local irritation. The symptoms may, moreover, resemble those of diarrhœa or dysentery, and cases have occurred in which the foreign body long escaped recognition, much medicine having been swallowed to no purpose.

Treatment.—The services of a judicious surgeon are indispensable.

Relaxation of the Sphincter.

In persons who have suffered from internal piles, or from falling of the bowel, the sphincter muscle, in consequence of frequent and long continued over-stretching, is liable to lose its power of contractility, and to cease to be a trustworthy sentinel. The anus becomes habitually relaxed through muscular atony, the condition resembling, although less in degree, the loss of power which attends paralysis.

Symptoms.—This is simply, in most cases, an unpleasant infirmity which shows itself by the involuntary escape of gas from the bowel, or, in diarrhœa, or under the action of laxative medicine, there may be, also, lack of power of retaining fæcal matter.

Treatment.—A simple and safe surgical operation, in which it is not necessary to use the knife, will promptly and satisfactorily improve the tone of the muscle and remove the disability. Neither strychnia nor ergot are reliable. As palliatives, avoidance of flatulent food and laxative medicine, local cold-water bathing, and injections may be tried.

Neuralgia of the Anus.

The existence of this distressing affection is undoubted, although in a large proportion of instances a careful inspection of the seat of pain will result in the discovery of a local and removable cause —most commonly a minute "irritable ulcer" or fissure. When this is not the case, the pain is most probably reflex, arising from some source of disturbance in the genital organs, which must be sought for and remedied. It has occurred as a sign of pregnancy, of dysmenorrhœa, and of prostatic nervous disorder.

Wounds and Contusions of the Anus and Rectum.

These injuries are as various in their character as to details, as the casualties which produce them. In some cases necessarily mortal, as where the vicious cow impaled the milkmaid with her horn, or the child sat down upon the leg of an upturned stool, yet the recoveries which often take place in apparently desperate cases make it a duty to secure the best aid as soon as possible. The most common, perhaps, are punctures received in squatting suddenly in the dark to relieve a call of nature, lacerated wounds from the breaking of a chamber utensil under the weight of the body, ruptures made in efforts to relieve obstinate constipation, and contusions from kicks, or falls astride a beam.

Symptoms.—Shock, fainting from internal bleeding, pain, bleeding externally, presence of foreign matter—perhaps of fæces, subsequently fever, heat, swelling, discharge of pus. Complications with injury of urinary organs, or the vagina, may cause symptoms of their own. As later consequences, abscess, fistula, and contraction, or stricture of the anus, or of the bowel, are not uncommon.

Treatment.—Stop bleeding, if necessary, by tying vessels; wash out dirt with syringe and tepid water; bring edges of wound together with sutures and plaster, and await symptoms and complications. In case of contusion, poultices, with the addition of lead-water, and rest on the back. Secure soft stools by castor oil, or warm-water injections. In case of persistent bleeding from within

the rectum, pieces of ice may be inserted. Where fæcal matter escapes into the tissues around the rectum, free incisions for external escape, washings with antiseptic solutions, and drainage tubes, with surgical aid, will be required.

The lacerations of these parts, which occur in childbed, are unwisely left to nature ; much suffering and subsequent regret may be saved by transferring the responsibility to the surgeon, for his art can remedy them.

Specific Ulcers and Eruptions.

There are certain sores and eruptions liable to affect the anus and its immediate neighborhood, especially in infants, which take their origin in poison inoculable from one individual to another—as from a nurse to her nursling. Whilst it is very desirable that the true nature of such symptoms should be ascertained at once, in the interest of the child, by appealing to the best professional advice, there are certain points to be always borne in mind: first, that personal fault is not necessarily involved in these cases—they may be, and often are, the result of simple ignorance or misfortune ; second, contrary to popular belief, they are often easily and entirely curable, if wisely managed ; third, in view of their obscure nature, and the general absence of exact knowledge concerning them, it is well to be slow in arriving at conclusions

General Remarks.

There is no class of diseases, so many of which are entirely preventable by obedience to the laws of hygiene, especially in reference to personal habits, as that considered in this chapter.

As to children, there are no diseases in which prevention requires more care and wisdom on the part of parents.

There are no preventable ailments so certain to assume a serious character, in consequence of failure to recognize them early ; and failure is the rule, for these simple reasons : ignorance of the serious consequences which follow neglect, and hesitation, through false delicacy, in applying for relief.

It is to be remembered that none of the functions which the Creator has made conditional to life in man can be safely ignored, or regarded as ignoble ; and that no physician, worthy of the name, considers them beneath his studious care.

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Diseases of the Organs of Circulation.

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DISEASES OF THE ORGANS OF CIRCULATION.*

Inflammation of the Sac Covering the Heart—Pericarditis.

This term is employed to indicate an inflammation of the thin membrane which covers the heart and lines the sac which surrounds the heart.

The membrane becomes opaque, thickened, congested, and covered by a layer of what is termed fibrinous exudation. At the same time more or less fluid accumulates in the sac, and contains little particles of fibrinous matter like that covering the surface. More rarely pus (matter) is formed. If the inflammation lasts a long time, the sac becomes much thickened. Sooner or later, as a rule, the fluid is absorbed or removed, and the surfaces coming together may adhere, and, becoming united, obliterate the pericardium or heart-sac, or leave bands which unite the heart and the opposed surface of the sac. The amount of fluid formed is usually small, though cases are recorded in which pints were found. More rarely there is an accumulation of fibrinous matter, with but little fluid.

According to duration and intensity, the disease is named *acute*, *subacute*, or *chronic*. According to the nature of the material which accumulates in the sac, it is denominated *simple*, where serum occurs; *purulent*, when matter is formed; *fibrinous*, where only fibrin exists, and *hemorrhagic*, when blood is present.

Causes.—This disease is usually an accompaniment of some general disease, or of a local inflammation in the neighborhood; and is very rarely independent of other conditions, or, as physicians say, *idiopathic*.

The diseases with which it is most frequently associated are

* [See Vol. I., Chapter on Anatomy, for a description of the Organs of Circulation.—Ed.]

acute inflammatory rheumatism, Bright's disease of the kidney, the eruptive fevers (scarlet fever, measles, etc.), cerebro-spinal meningitis (spotted fever), pyæmia (blood-poisoning by matter), and scurvy on the one hand; and on the other, pleurisy, pneumonia, peritonitis, or a local inflammation in the neighborhood. It is at times due to an injury, as a stab or gun-shot wound, and is then termed *traumatic*.

The first two of the above list and pleurisy are the causes in a large majority of cases.

Symptoms.—This disease may be developed insidiously, and the patient be made worse by its existence, without drawing attention to his heart as the site of pain or distress. In other cases he suffers from pain and tenderness in the region of the heart, at times sharp, cutting, though usually not very severe. The fever of the causative disease becomes increased when pericarditis is developed; but it is rarely high in the simple form of the disease. The breath becomes short, either from the accumulation of fluid in the heart-sac, or from weakness of the muscular fibre of the heart. The pulse varies considerably; at first it is, perhaps, full and strong, but it becomes weak and small as the fluid accumulates or the muscular fibre becomes degenerated. A dry, suppressed cough also occurs without the existence of any lung trouble. Pain or difficulty in swallowing may exist, because the food, as it passes along the tube (œsophagus) from the mouth to the stomach, behind the heart, presses on the inflamed sac, or meets with obstruction from the pressure of the full sac.

Delirium is occasionally present. At first the heart throbs, palpitates, and later becomes feeble in its action. Faintness, too, is apt to be felt on exertion in the severe cases.

Difficult as it is to distinguish the disease by the symptoms alone, it becomes very easy when auscultation, percussion, and palpation of the region of the heart are employed. The roughened surfaces cause rubbing sounds to be heard during the movements of the heart. The eye notes and the hand feels that the beat of the heart is feeble or lost, and percussion maps out a large, dull space in the region of the heart, when fluid exists in the sac.

The Prospects of a patient (the prognosis) with pericarditis depend much upon its cause. Where it is due to acute inflammatory rheumatism or simple pleurisy, the patient may, as a rule, be expected to recover. Bright's disease and the eruptive fevers give a more unfavorable outlook; and with pyæmia (or blood-poisoning) it is part of an almost invariably fatal disease.

The disease may end in complete recovery, or the heart, becoming agglutinated by the new tissue to the pericardial sac

may later become enlarged by overgrowth or dilatation. This is, fortunately, an infrequent result. More rarely still the sac becomes thickened and is distended with fluid, or occupied by the fibrinous material before spoken of, the acute terminating in the chronic disease with but little hopes of improvement. The disease may terminate in sudden death, owing to arrest of the action of the heart produced by the compression by the surrounding fluid, or by a change in its muscular fibres. This is most apt to happen during some exertion.

Treatment.—This must be in the main general, and directed against the disease which produces the inflammation. At the outset, agents which quiet the excited heart's action are useful, as aconite, digitalis, etc. Later, these remedies may be harmful. Externally, especially when fluid is present, counter-irritation by blisters or the tincture of iodine is useful. For the pain, poultices may be applied. The only remedy which it would be wise to use without a physician's direction is some stimulant, as brandy or the aromatic spirit of ammonia. Of the latter a teaspoonful in a wineglassful of sweetened water may be employed, and may be repeated as often as every one, two, or three hours. These are available in case faintness occurs and the physician has left no directions.

The patient with this disease, especially if it is associated with pleurisy or pneumonia, should be very careful about exertion. The safe rule is that he should keep perfectly quiet. At times it is necessary to draw off the fluid by means of an aspirator or syringe, or by tapping. Of the necessity for and the advisability of this measure, a physician must be the judge. During convalescence, tonics, careful exercise in the open air, and good, nourishing food, must be relied on.

Inflammation of the Interior of the Heart—Endocarditis.

This term—*endocarditis*—signifies an inflammation of the lining membrane of the heart. The left side of the heart is much more frequently affected than the right. The valves, also, are much more subject to the disease than the rest of the membrane. These valves, it should be remembered, are double folds of the lining membrane, strengthened by a small amount of firmer tissue. In the earlier part of the disease the valves become swollen, often looking as though they contained a little water. Sometimes they are slightly reddened. They not infrequently become coated, especially on the side over which the blood rushes, with little, soft masses called vegetations, which are derived from the blood—a material in it, termed fibrin, having the tendency to accumulate

on a rough or inflamed surface. At times little outgrowths, which are like warts, spring from the valve, and on these vegetations may form. This is more apt to happen in the chronic forms of the malady.

A more severe and dangerous form is denominated *ulcerative*, and is characterized by large masses of soft material on the valve, and the ulceration and perforation of the valve. This material is composed, to a greater or less extent, of those minute organisms called bacteria. (See chapter on The Acute Infectious Diseases.) The late changes in the ordinary form are more serious than the immediate ones, and lead to thickening, which constitutes a part of chronic valvular disease of the heart. Fortunately every case does not so terminate.

Causes.—Endocarditis, like pericarditis, is rarely an independent or idiopathic disease. The ordinary form is due to rheumatism, Bright's disease, the eruptive fevers (especially scarlet fever), to pericarditis, pleurisy, and pneumonia. Acute rheumatism is the most frequent cause. The ulcerative variety is due to septic diseases (blood-poisoning), including puerperal or child-bed fever.

Symptoms.—Endocarditis, of itself, produces but few symptoms. Palpitation of the heart, slight pain or distress in its vicinity, a little increase in the symptoms, fever, restlessness, etc., of the causative disease, are the most marked events. It is generally made out by the physician, who, in listening to the heart, hears a murmur accompany or take the place of the proper sounds of the heart, more especially of the first sound. Many of the cases are discovered in this way rather than by the symptoms. When the little vegetations have formed on the valves, and more especially in the severe ulcerative variety, these may be swept away with the blood-current, and, coming to an artery through which they are too large to pass, block it up. This affection is called *embolism* (see **Embolism**). A sudden paralysis of one side of the body, especially of the right side, or the sudden development of aphasia (*i. e.*, loss of the memory of words, or of the method of pronouncing them, the tongue being movable in all directions), indicates that embolism has occurred in the brain.

In the rheumatic and acute forms, other than the ulcerative, the prospect of recovery (prognosis) is good. The great danger is not immediate, but that in the future it may lead to chronic valvular disease with its attendant troubles. (See **Valvular Disease.**)

Treatment.—This consists in quieting the action of the heart if excited, and in avoiding the excitation of the organ by exertion or in any other way. The main treatment must be directed against the disease causing the endocarditis.

Inflammation of the Substance of the Heart—Myocarditis.

This term is used to designate an inflammation of the muscular structure of the heart. It is not a disease of frequent occurrence, and several varieties are included under this common head:

I. A swelling of, and a granular change in the muscular fibres may develop during the course of febrile diseases, especially if protracted.

II. During the course of typhoid fever the muscular fibres at times lose their striated appearance and become translucent, uniform, glassy-looking. This is spoken of as "myositis typhosa," or glassy swelling.

III. During the progress of pyæmia (a form of blood-poisoning), small abscesses, or abscess-like spots, may form in the heart. This is designated by some as acute myocarditis.

IV. There is still a form which occurs in the left side, and especially in the wall of the large cavity—the ventricle. It is more generally developed in connection with thickened endocardium; or less frequently with thickened pericardium. There is an increase of that connective substance which binds the muscular fibres together, and hence a compression or destruction of these fibres. The first two classes are, perhaps, more properly degenerations than inflammations.

Symptoms.—They produce the weakened heart's action and the feeble pulse which characterize continued fevers, and are among the dangerous influences of the febrile processes. Beyond the indications above mentioned, a feebleness or an absence of the first sound of the heart discloses to the physician the existence of the disease.

Treatment.—A tonic, supporting, and stimulant treatment is indicated, as preventive of paralysis of the heart, which may ensue, and a treatment which, by the use of packing, sponging with cool water, and baths, or by the administration of quinine in large doses, aims to prevent the fever from becoming excessive, and is rational as a preventive (prophylactic) measure. Patients in whom the degeneration exists should avoid sudden exertion.

The third form is not readily recognized.

The fourth form is chronic, and may allow of dilatation of the left large cavity—the ventricle—locally or generally.

Chronic Valvular Disease.

This term is used to signify a number of different conditions which produce similar results, viz.: thickening, or else insuffi-

ciency of the valves. The importance of any change in the valves may, in the main, be said to be equivalent to the amount of *obstruction* it offers to the current of blood, or of the amount of blood which it permits to flow back into the cavity from which it has come. This latter condition is called *regurgitation.*

These diseases are of far greater frequency on the left than on the right side of the heart. The valves, instead of being thin, delicate, pliable folds, may become firmer and thicker by development of connective tissue, or by a deposit of lime salts, when they are frequently said to be ossified; or the edges of the segments of the valves may become united so as to prevent their closure, and only leave a small opening for the blood; or one or more segments may become adherent to the wall of the artery or heart-cavity; or again, a rupture may take place through the valve, or a tendinous chord may be torn from the valve, and in this way regurgitation (flowing back) of blood allowed. The effect upon the heart is noticeable in the increased size of its walls and of its cavities. The former is called hypertrophy, the latter dilatation. The site of the hypertrophy and dilatation will vary with the valve affected, so that at times one side of the heart may be normal, while the other is greatly enlarged. If, however, two sets of valves are affected, as the aortic and the mitral, both sides of the heart will usually be greatly enlarged. The rule is that the walls of that cavity at whose outlet obstruction or regurgitation occurs are first thickened, and later the cavity itself dilates.

Causes.—The most frequent cause of chronic valvular disease is acute articular rheumatism, the acute inflammation of the valves becoming chronic. Cases, too, occur in which a recurrence of the rheumatism excites additional change in the valve. Other cases may be referred to an attack of scarlet fever. Advancing age induces certain changes in the inner coat of the arteries, and, in the aortic valves more especially, atheroma and calcification. It is supposed, also, that work attended with severe strain may induce chronic inflammation in the arteries and valves. The writer, however, believes that syphilis is the cause of not a few of these cases. The difficulty of elucidating the cause is due to the fact that, in many cases, years elapse between the time of primary injury in the valve and the development of the secondary effects which induce the patient to apply to a physician with reference to the heart disease. It is on this account that a difference of opinion exists as to whether certain forms are present at birth (congenital), or are due to some disease of early infancy.

In the examination of a person who has died of chronic valvular disease, it is customary to find congestion of the lungs, liver,

kidneys, stomach, etc.; and, not infrequently, dropsical accumulations of fluid in different positions, such as the pleural cavities, around the bowels, and so forth.

The brain, also, though less markedly, may show congestion of its veins, and some increase of the fluid normally present. Usually the limbs are swollen from accumulation of fluid beneath the skin.

Symptoms.—From the sketch of the changes which are found on examination, it is apparent that not the valvular disease only, but its results also, are of importance. The increase in the muscular structure of the heart, at the outset presents the effects which would otherwise manifest themselves. Later, dilatation, with or without fibre-degeneration, occurs, and then the effects of lack of blood, or of the congestion of the various parts, produce symptoms. So, also, symptoms may be developed when, from some cause, the heart has been weakened by degeneration of its fibres, general debility, or a watery state of the blood, which will disappear under proper treatment. The following are most noticeable among the symptoms:

First. Palpitation, or a forcible heaving of the heart. This is more apt to be developed by some exertion in the earlier stages of the malady. Palpitation may disappear under conditions noted above, being dependent upon causes which would induce it in otherwise healthy persons.

Second. Shortness of breath, after exercise, frequently exists with the palpitation. As the disease progresses, the patient feels the desire for fresh air, even when quiet; and when dropsy develops, such a condition of distress obtains that he is only comfortable in a sitting posture. This is an earlier and more prominent event in disease of the mitral than in disease of the aortic valves.

Third. Bronchitis, spitting of frothy serum, or even of blood, are events more especially of mitral troubles, being dependent upon the congestion of the lungs.

Fourth. Slight jaundice is apt to appear when the liver becomes congested, and at the same time a sense of fulness is experienced under the right lower ribs.

Fifth. Over-distention of the vessels of the stomach and intestine may cause dyspeptic symptoms, vomiting, perhaps with some blood.

Sixth. The urine becomes scanty, high-colored, at times containing blood, owing to the fulness of the vessels of the kidney.

Seventh. Dropsical swellings, as a rule, make their appearance late in the disease. Exceptionally, however, a watery state of the

blood permits the temporary occurrence of dropsy at an earlier period.

Eighth. Pain and a sense of distress in the region of the heart are complained of by some. The pain may have those characteristics which constitute what physicians term *angina pectoris*, especially in diseases of the aortic valves.

Ninth. Owing to gravity, the brain does not suffer from congestion as much as the other organs; yet sleeping with the head raised, disturbed sleep, mental dulness, and other evidences of imperfect mental action, may indicate its occurrence. Paralysis of one side of the body may occur in the course of heart disease, owing either to an embolus obstructing an artery of the brain (see **Endocarditis**), or to hemorrhage in the brain. Physicians are enabled to distinguish the disease, and to decide which set of valves are affected, by listening to the heart (auscultation).

Pain in the region of the heart is frequently supposed to indicate heart disease, when really it proceeds from indigestion. Palpitation is also popularly supposed to imply organic heart disease, when really it may depend upon the use of tobacco, coffee, etc. The best methods of discriminating between these and organic heart trouble, are those offered by listening to the heart, and by the evidence of enlargement of the heart. Yet the reader must be warned that a murmur may be due to other causes than disease of the valves or of the heart. A watery state of the blood, slight pressure on an artery, sounds made in respiration, pressure exercised on the artery in the neck of the examining physician, may each cause a murmur to be heard, which may be mistaken for a sign of organic heart disease. These are discussed because of their importance with reference to the procurement of a policy of life insurance. A murmur due to an aneurism (a pouch-like dilatation of the walls of an artery), or other disease of the aorta (the large artery of the heart), may likewise be mistaken for a heart murmur.

The Prospect of a patient (prognosis) with valvular disease depends upon the amount of obstruction or leakage; whether only one or more than one set of valves is affected, and upon the degree of heart-stretching or overgrowth of the heart. Many persons with valvular disease live for a long time, and suffer but little from its effects; being able to conduct a large business, etc. Sudden death in chronic valvular disease is by no means so frequent as is generally supposed. It is most likely to happen when closure of the valve at the commencement of the aorta is imperfect: yet only a small proportion of those affected with this disease die in this manner. The supervention of Bright's disease is dangerous.

The symptoms caused by congestion of the kidneys, however, may be mistaken for those of this disease.

Treatment.—A person with chronic valvular disease should lead such a life as prevents undue excitement of the heart. He should not engage in any business requiring heavy lifting or forcible exertion. He should avoid a house which requires him to frequently mount numerous stairs, or a home where he would be obliged to ascend hills regularly. He should be clothed in flannel during summer and winter, and should carefully avoid what is popularly termed "catching cold." He should not allow his blood to become watery, so that the lips look pale, as thereby dropsical affections and irregular heart-action are produced more readily than in people with sound hearts. He should avoid over-eating, and such quantities of tea, coffee, and tobacco as cause irritability of the heart. In a word, he should lead as calm, equable, and temperate a life as his disposition will admit of. Boat-racing, running-matches, ball-playing, rope-jumping, should be abjured by the young having this affection. The least sign of rheumatism should be instantly attended to, for fear that an increase in the disease of the heart might be brought about. As far as medicines are concerned, they should be taken under the direction of a physician. He will be able to decide whether digitalis or a heart-sedative are requisite. It may, however, be stated that digitalis is the main reliance in cases of feeble or irregular heart-action. In case a fainting-fit should occur, ammonia (hartshorn) should be inhaled, the bottle being held near the nostrils, though not for a longer period than a few seconds at a time. Or 10 to 15 drops of water of ammonia, or a teaspoonful of the aromatic spirit of ammonia, may be taken in sweetened water (a wineglassful).

The dropsies require, at times when remedial measures will not afford relief, puncture of the limbs with a needle, or tapping of the abdomen or chest.

Overgrowth or Hypertrophy of the Heart.

This consists is an enlargement of the heart, due to an increase of its muscular tissue. This increased thickness may affect the wall of one, or that of each cavity, according to the position and the nature of the exciting cause. As a rule, it may be termed a compensative affection, without which the patient would die, or survive with extreme discomfort. It may exist with or without dilatation or stretching of the affected cavity.

Causes.—Any obstruction to the circulation—as valvular disease, narrowing of the aorta (the large artery,) or of the pulmo-

nary artery (the artery leading from the right side of the heart to the lungs), Bright's disease of the kidney, or emphysema (dilatation of the air-vesicles), chronic thickening or firm compression of the lungs—may produce this complaint. In addition to this category we have another, in which over-action of the heart, as in soldiers marching with heavy knapsacks and tight dress, in brakemen on cars, or in persons engaged in and training for boat-races, running-matches, or, still more rarely, excessive and long-continued rapidity of the heart's action, brings about some enlargement.

Of all these, continued palpitation is least efficient, in many cases not inducing any noticeable enlargement. The philosophy of the process is similar to that which leads to overgrowth of other muscles. Formulated into a law, it may be said that when increase of function will result from an increase of size, overgrowth results from increase of work. There is a limit, however, in the heart as in the muscles, varying in different individuals, beyond which excessive work ceases to cause increased growth, but leads to over-stretching of the cavities, or perhaps degeneration of its substance. The special effects on the ventricles, according to the seat of obstruction at the valves, has been referred to under the head of **Valvular Diseases.** Bright's disease leads to simple enlargement of the left side of the heart—the ventricle. Narrowing of the aorta, or obstruction in the smaller arteries, produces the same result. Trouble in the circulation in the lung induces enlargement of the right side of the heart—the ventricle. Over-action of the heart, also, especially affects the left side—the ventricle.

Symptoms.—The principal symptoms of the disease consist in the more evident and palpable force of the heart-beat, and in its greater lifting or heaving character. As in most cases, the enlargement is compensative; much of the associated feelings and distress is owing to the exciting cause. At times, however, the head may throb, or the patient be troubled with ringing in the ears, or spots before the eyes, owing to the greater force with which the blood is sent to the brain.

The prospect is, in the main, dependent upon the cause of the enlargement. In cases of simple enlargement of the left side of the heart from Bright's disease, or where it is more than sufficient to overcome the obstacle, a rupture of a vessel in the brain may occur, and apoplexy result. The enlargement may, if it is slight and the cause is removed, be recovered from. If the cause continues in operation, dilatation is sooner or later associated with the enlargement. Of many hearts we have to say that either the hypertrophy or the dilatation is predominant.

Treatment.—Treatment for hypertrophy will be requisite in

those cases only in which it is due to removable causes, or where, owing to excited action, it is greater than is required to overcome the obstruction. All causes of undue excitement of the heart must be avoided, such as mental excitement, overloading of the stomach, and severe exertion. Coffee, tobacco, tea and alcoholic drinks should be given up if found to be injurious, and should be taken only in moderation, in any event. Palpitation of the heart should lead the sufferer to seek a physician's advice, as he is the best judge of the most appropriate treatment. Such persons as have acquired somewhat enlarged hearts, from too great or protracted physical exertion, should abstain from this in the future.

Dilatation or Over-stretching of the Heart.

Sometimes as the result of previous disease, the cavities of the heart become distended so that they are capable of containing more blood than natural. Dilatation is usually associated with more or less increased thickness of the wall of the affected cavity. It may implicate each, several, or all of the cavities. Naturally, each cavity will hold about two ounces of blood, though capable, when distended, of considerably exceeding this. Usually the increase is once, twice, or more times the natural amount. In cases where the walls appear thinned, the muscular structure may be normal in amount, but stretched.

Causes.—This condition is produced by processes which either diminish the resistance of the muscular tissue, or increase the pressure within the heart, or prevent or render difficult the complete emptying of the cavities. In some cases these methods may unite to bring about the result. Hence, valvular disease, inflammation of the substance of the heart, adhesions of the heart, obstruction to the blood in the great arteries near the heart, degeneration of the muscular tissues, or advancing age, may occasion it. On the right side it may be brought about by such diseases of the lung as render the pulmonary circulation difficult. It should be remembered that the more rapidly the cause operates, especially if at the same time the heart by exertion is forced to work actively, the greater is the probability that dilatation will occur. Though the lung-tissue, and hence a part of the blood-vessels in the lung, are destroyed in consumption, the heart neither becomes enlarged nor dilated. The weakness which the disease causes, and the diminution of the amount of blood, account for this.

Symptoms.—A person with a dilated heart has usually the primary cause as well as the secondary dilatation to contend with. When dilatation becomes marked, or predominates over enlarge-

ment (*hypertrophy*), the person will suffer with over-distention of the veins of the parts back of the dilated cavity (back with reference to position in the circulatory circuit), and from a diminished amount of blood in the arteries. The brain, as before mentioned, will suffer less than the other organs, because gravity will prevent some of the evil effects. The pulse is apt to be small, becoming frequent on exertion, feeble; occasionally, however, slow. The veins of the neck, when the right side of the heart is dilated, become prominent and may pulsate. The congestion of the lungs, liver, kidneys, etc., and the dropsies mentioned under the head of **Valvular Diseases**, make their appearance, for, when valvular disease exists, dilatation is often a cause of these phenomena. Where there is no such disease, the dilated cavity, not emptying itself, is unable to receive a full charge of blood, and is unable to propel the blood with proper force, and, as a result, the capillaries and small vessels become overfilled.

These patients have a sense of distress in the region of the heart, and attacks resembling those which physicians call angina pectoris. They also get out of breath easily, or have attacks of difficult breathing independent of exertion, which, as in valvular disease, may prevent them from lying down. An inspection shows the heart-region to be more or less prominent according to the amount of dilatation. The beat of the heart is enfeebled, diffused, perhaps replaced by a sort of wave-like sensation over the space occupied by the heart.

Where the dilatation has been produced by a cause which has ceased to operate or is removable, then recovery may be possible, provided the disease is not far advanced. But, where it is due to marked valvular disease, pericarditis (inflammation of the heart-sac), myocarditis (inflammation of the muscular fibre), or is far advanced, it proceeds steadily to a fatal issue.

Treatment.—The treatment must in the first place be directed toward removing or diminishing the effect of the cause, or of any secondary conditions which aid it. In the majority of cases the cause will be a persistent one, and we shall be obliged to be content with modifying its effects. Hence, if the heart be irritable, palpitating under slight excitement or exertion, rest and cardiac medicines which quiet the heart's action, will be advisable, with such other medication and advice as the history and symptoms warrant. Anæmia and all debilitating conditions should be removed quickly. Where also the disease has produced its effects rapidly, the heart should be allowed, as it were, to become accustomed to it, and all violent and protracted exertion should be avoided. The hope is, that under these circum-

stances we may favor enlargement or hypertrophy, rather than dilatation.

When dilatation is established, we have to be guided by the same rules as were laid down under the head of **Valvular Diseases**; using digitalis, ether, stimulants, and the different methods for the removal of dropsy.

Fatty Degeneration.

This disease is usually divided into two classes. The first comprises those cases in which an extra amount of fat tissue exists upon and between the muscular fibres; the second, those in which the muscular fibres are themselves the seat of the morbid change. In this variety oil-globules and granules are observed in the fibres by microscopic examination, and obscure, to a greater or less degree, the normal striations. In the former class the muscular tissue is often less than normal, and the fibres work at a disadvantage. In the latter the power of the affected fibres is weakened. The walls of the large cavities (the ventricles) are more affected than the walls of the small cavities (the auricles). The second variety is not infrequently associated with the first.

Causes.—The form in which fat is present in excess is infrequent under twenty years of age, and whatever tends to increase of fat in the body, as hereditary disposition, indolent life, excess of fat-producing food, alcoholic drinks, may predispose to or cause the complaint. The second form may occur at any age, but is most frequent after forty years. It may result from febrile diseases, poor blood (anæmia), the abuse of alcoholic drinks, the changes of advancing age, Bright's disease of the kidney, obstruction of the nourishing artery (coronary) of the heart, or phosphorus taken as a poison.

Symptoms.—In cases of moderate change, there are few evidences of the disease. An unnaturally slow, feeble pulse, or an irregular, frequent one, provided other conditions liable to cause it have been excluded, is an important symptom. Attacks of faintness and of temporary loss of consciousness, called pseudo-apoplectic attacks, may occur. Shortness of breath, on exertion, is apt to be complained of; at times this distress is independent of exertion, and occasionally severe chest-pain is felt (angina pectoris). The circulation is poor, the extremities, perhaps, cold, and slight dropsical swelling may appear. The presence of a white ring (arcus senilis) around the transparent portion of the eye (cornea) has no great signification. The visible area and the palpable force of the heart's action are diminished or lost, and the heart is

found normal or nearly so in size; or, at all events, whatever other changes may be noted, are not sufficient to account for the condition.

The Prospect of the patient (the prognosis) is unfavorable in advanced steps of the malady. Where the disease has been due to some recent and removable cause, as excess of alcohol, or febrile disease, providing these have ceased to act, a cure may be obtained. On the other hand, when a part of the senile change is due to obstruction of the nourishing artery of the heart, no hope of a favorable event can be entertained.

The disease, as above stated, may be cured in some cases. Rupture of the heart, or sudden cessation of its action, are the great dangers to be apprehended. Again, if an acute febrile disease should occur to a person with fatty heart, his prospects of recovery would be less than if he had a normal heart. So, also, it should be recollected that persons with fatty heart have died from the inhalation of a small quantity of chloroform, or after the administration of hydrate of chloral in doses which were not excessive.

Treatment.—In the first case, the cause, if possible, must be removed. If excess in eating or abuse of alcohol have led to it, the person should stop the excess. Anæmia (poor blood) should be cured by ascertaining and, if possible, removing its cause, as well as by the administration of iron, and remedies which help digestion, etc. In all cases the patient should avoid sudden severe exertion, such as lifting, pulling on tight boots, or straining in order to procure a passage from the bowels. He should see that the bowels are kept open. He should not take chloroform under any circumstances, nor chloral without a physician's direction. All medicines which enfeeble the heart's action, as aconite, should be avoided. He ought not to allow himself to become angry or excited. With care he may avoid a fatal issue for a considerable period. In diet he should take comparatively less of the starchy, saccharine, and fatty, and more of the nitrogenous articles (animal food).

Embolism and Thrombosis.

These terms, though used together, have a different signification. An *embolus* is a plug, not in each instance of the same composition, which may be found in a vessel, artery, heart, vein, or capillary, to which it may have been carried by the blood-current from some other part of the vascular system than that in which it was formed or entered the circulation. A *thrombus*, however, is composed of a clot or mass of blood or lymph, situated in the

heart, artery, vein, capillary, or lymphatic vessel, which has been formed at the place where it is found.

Emboli are most frequently little pieces which have broken off from a thrombus, or one of the little vegetations which have been mentioned as forming on the heart-valves when inflamed. They may, however, be composed of little pieces of calcareous matter which have been derived from a calcified artery or heart-valve, or a portion of a torn valve; oil-globules which have found entrance to the circulation by an open vein, as in fracture of a bone; pigment, which has formed in the spleen in severe malarial fevers; part of a tumor which has grown into a vein; hydatids (a parasite), which have gained access in a similar manner; or bacteria in septic diseases. In the lower animals the effects of the disease have been produced by forcing little pellets of paper, pith, or the powder of lycopodium into the circulation. The plug (embolus) is generally found in an artery, because the cause producing it is usually situated in the heart, or at the commencement of the large artery going from the heart (the aorta); or, if in the veins, the plug will be carried from smaller to larger vessels till it reaches the right side of the heart, and thence it passes into the branches of the artery going to the lung (the pulmonary). The liver forms an exception to this: for, as the blood returning from the stomach and bowels goes to the liver, it passes through veins (portal) that become smaller and smaller till they break into capillaries. Hence, any clot in the veins of the stomach or bowels may furnish an embolus for the veins in the liver, which is not a very infrequent occurrence.

The effects produced by an embolus vary:

First. With the nature of the process which has existed at the point from which it was derived.

Second. With the amount of obstruction produced by it.

Third. With the nature of the circulation beyond the obstructed point.

As a rule, it may be stated that, if the embolus has come from a portion of the body at which there was gangrene or suppuration, these will be excited in the part to which it is carrried. This constitutes a part of the process called pyæmia. Where the artery which is occluded does not communicate with another artery beyond the obstruction, or its capillaries do not communicate with the capillaries of another artery, a complete obstruction will destroy the function and the life of the part supplied by it. At the same time, if there are no valves in the vein between the part and the heart, a hemorrhage into the tissues is apt to take place, owing to the blood being forced back in the vessels of the part weakened

by lack of nutrition. This is called "hemorrhagic infarction." The arteries of the brain on the left side, more especially, of the spleen, kidneys, and of the lungs, are the most liable to receive an embolus. The large artery of the leg may become obstructed, and death of the limb ensue; so also, but more rarely, an arm may be similarly affected.

The embolus, after producing obstruction, may become broken, so as to allow a return of the circulation. It may increase in size, owing to a clot forming on the plug, and hence an increase in the original trouble result. Rarely an inflammation is excited around the plugged vessel, when it has come from a spot where no inflammation, gangrene, or suppuration exists. Embolism of the pulmonary artery may cause sudden death.

Treatment.—Persons who have clots of recent origin in a vein in any situation, more especially in the veins of the legs, should be warned to keep quiet, lest a piece may become detached; so also, rubbing or forcible pressure should be avoided for a similar reason.

Thrombosis, as already stated, may occur in the heart, arteries, veins, or capillaries. The causes which produce it may be ranged under several heads:

First. A diminished force of the circulation, due either to weakness of the body or to a change in the heart-muscle, or to a diminution of the elasticity of the arteries near the heart.

Second. A dilatation of the heart, or artery near the heart, by inducing a slower circulation in this part.

Third. An altered condition of the walls of the heart or vessels, so as to make them rough, or present obstacles to the circulation.

Fourth. Pressure upon the vessel.

Fifth. Injury of the vessel, as in rupture or ligature.

Sixth. The blood is more liable to form a clot when an inflammation exists, than during a continued fever or in health.

The clot may form either quickly or slowly. In the latter case it will be made up of layers, or, as physicians say, "laminated."

They may either fill up the vessel, totally obstructing it, or simply form a layer of varying thickness on the wall. After the clot has formed, it may soften and disintegrate, constituting *emboli;* or a piece may become detached to form an *embolus.* In other cases they become organized, or have a channel formed in them, or, becoming filled with the salts of lime, undergo calcification.

The Result in thrombosis will vary, as in embolism, with the site of the process. If in the veins of an extremity, which have a freer communication with one another than arteries, they may

simply occasion a swelling of the limb, and a corded feeling along the course of the vessel.

Only when all the veins coming from a part are completely obstructed, is death of the part likely to occur. Where an artery is affected, similar effects may be expected as those described in embolism, with the exception that, if the clot forms slowly, more time will be given for circulation to be established in communicating vessels, if such exist.

Blue Disease—Cyanosis.

By this term is meant a blue color of the skin, due to the circulation of imperfectly purified or oxygenated blood. The cause of this condition is some congenital (present at birth) malformation of the heart, or of its principal branches, which allows a mixture of venous and arterial blood. It is not uncommon, however, for physicians to use the term *cyanosed*, when they intend to describe the condition which exists as a result of any cause that considerably interferes with the proper aëration of the blood. The bluish, dusky tint to the lips, under the nails, and perhaps of the skin more generally, which is seen in croup, pneumonia, pleurisy, etc., is frequently spoken of in this way.

Some of the infants born with this condition are either unable to live, or survive for only a short period. Others, however, with a less serious malformation, may attain a considerable age. The dusky hue may be present to some extent all the time, or become manifest on exertion, or during fits of crying or of coughing. At all events, these latter circumstances markedly increase the coloration of the skin. It ought to be understood that the color of the skin is due to the natural coloration of its parts, in addition to that of the blood in its vessels, more especially in the capillaries. The reader may recall some person, the pale color of whose skin was due to a watery state of the blood, or followed a severe hemorrhage, the skin then showing its color with but little blood.

The conditions which are found on the examination of those dead with cyanosis, vary. There may be a large opening between the two auricles. This is normal before death, but is closed within a week after birth, except that a very small opening, which is of no importance, may remain. Sometimes a deficiency is found in the wall which separates the two ventricles; or again, the position of the arteries may be reversed, so that the artery which sends blood to the body comes from the ventricle, which receives the blood from the body, and not from the lungs, as it should. In these cases

an opening in the partition between the two auricles, and an existence of an artery called the "ductus arteriosus," situated between the aorta and pulmonary artery, may allow sufficient aërated blood to reach the body, life being thus retained. Again, a narrowing of the trunk of the pulmonary artery, or of the aorta, may exist, and be compensated for, as mentioned under the head of transposition of these vessels.

Treatment.—No medicine is of any avail as curative of this condition. Such children should be carefully watched, restrained from crying (if it is possible), and kept with more than ordinary care from the risk of whooping-cough, bronchitis, and colds.

Angina Pectoris.

By this term is meant a peculiar nervous affection of the heart, associated with pain and a sense of impending death. The examination of the body of a patient who has died of angina pectoris discloses varied derangements of the heart or large artery leading from the heart—the aorta. These have been fatty degeneration of the muscular fibre; valvular disease, aortic particularly; obstruction of the nourishing arteries (coronary), and aneurism (local dilatation) of the aorta.

Symptoms.—The phenomena of the disease occur in paroxysms, with intervals, which progressively shorten. They consist of a peculiar sense of weight, burning or pressure over the heart, extending at times from the heart to the chest and back, or down the left arm to the elbow or fingers, or into the right arm; or, more rarely still, into the legs, and of the feeling that the heart is about to cease beating, and that death is impending. The face is usually pale, and the pulse is either natural, or small, feeble, and perhaps irregular.

The first attacks usually occur as the result of some exertion, which the patient instantly ceases from with the feeling that, if continued, death would at once result. Later, they may be developed independent of any exertion.

The result of true angina pectoris is death from cessation of the action of the heart in one of the attacks. Yet persons who have died of the affection, have had long intervals, sometimes of years' duration of comparative comfort and health, between the attacks.

There is a peculiar affection which simulates angina pectoris, and is sometimes described as *neuralgia of the heart*. Such attacks may be due to accumulation of gas in the stomach, or to neuralgia in this organ. The latter is distinguished from the former by the

absence of any evidence of structural change in the heart or aorta; also, as a rule, by the absence of that vivid sense of impending death, and by the presence of a regular action of the heart during the paroxysm. There is a possibility that obstruction of the coronary artery might be overlooked and too favorable an opinion be given. The mistake in the other direction is the rule, the neuralgic or stomach affection being supposed, by the patient, to be the true disease.

Treatment.—The treatment during the paroxysm must be directed to the relief of the painful symptoms. The medicine which, of late years, has found the most favor, has been the nitrite of amyl—three to five drops being placed on a piece of cotton or a handkerchief and cautiously inhaled. Ether, also, may be inhaled, putting a tablespoonful or more on a handkerchief. Chloroform should be avoided, except under careful medical direction. Morphia in one-eighth or one-quarter grain doses may be injected under the skin. Aromatic spirit of ammonia may be administered in half-teaspoonful or teaspoonful doses diluted with a wineglassful or more of water. Hoffman's anodyne may be given in teaspoonful doses similarly diluted with water.

In the intervals between the attacks, the patient should lead a quiet life, avoiding severe muscular effort, or violent mental emotion. He should also secure as favorable action of the stomach and bowels as possible, avoiding excess in eating or drinking.

Palpitation.

This is a functional disease or action, and usually exists without any organic change either in the valves or in the structure of the heart. It may, however, exist in people with diseased hearts, and be due to the same causes that produce it with the healthy. What is meant by the term is, that the heart beats more frequently than natural, and also makes its beating manifest to the person. One form exists with enlargement of the gland in the middle of the neck, called the thyroid and protrusion of the eyes, named Exophthalmic Goitre, or Graves's Disease, or Basedow's Disease. The palpitation in this affection is a marked feature.

Causes.—The heart, like the rest of the muscular, and also the nervous system, does its work most quietly and regularly when properly nourished, and, as it is excited and controlled by two different sets of nerves, the one hurrying, the other slowing its action, those agencies which produce what is denominated nervousness, have a strong influence upon, and tend to produce, this condition. All are probably aware, from personal observation, of

the effect of mental excitement upon the heart. Weakness, due to whatever cause, tobacco, coffee, tea, indigestion, and secret indulgences, are among the most prominent causes. The female sex, owing to the less power of nervous control, is especially subject to this affection.

Symptoms.—The distinguishing feature consists in the occurrence of attacks of violent or rapid beating of the heart under circumstances which, in the normal state, would not be capable of developing them. These are followed, in some cases, by copious discharges of urine.

The prospect (prognosis) in these cases is good, providing there is no actual disease of the heart. The usual result is recovery. In some few cases, continued palpitation is the first evidence of the disease called exophthalmic goitre. The enlargement of the heart which ensues from continued palpitation is, at most, slight.

Treatment.—First remove the cause. People with a tendency to palpitation should use coffee, tea, tobacco, sparingly, or not at all. They should strengthen the nervous system by exercise in the open air, cool sponge baths and salt-water bathing, and by giving up any injurious habit in which they may have indulged. When severe or continued, aconite, veratrum, or digitalis, and the proper application of electricity (galvanism) to the nerves in the neck, furnish the best means of combating the malady. These measures should not be resorted to except under the direction of a physician.

Rupture of the Heart.

Rupture of the heart is, fortunately, a rare affection, and never occurs when the organ is sound. It may occur in either of the auricles—the small cavities, or in the ventricles—the large cavities—though the ventricles, and of these the left one, is most frequently the site of the rupture. Either the fibres will be found degenerated, or disease will exist at the point of rupture, as an aneurism, softening, abscess, etc. The result of the rupture is the penetration of the blood into the heart-sac, death happening very quickly, as a rule. Where the rupture has been small, it is possible that life may be prolonged some little time.

Aneurism of the Heart.

This term signifies a localized sac or pouch in the heart-wall, and communicating with the cavity of the heart. The size of the sac is variable. Some only attain the dimensions of a small nut, while others are as large as the heart itself. The left side of the

heart is alone affected, the left ventricle, with a few exceptions, being the site of the disease. As a rule, the lining membrane of the heart (endocardium), and the membrane covering the heart (pericardium), present evidences of old inflammation; and it is not uncommon to find the surfaces of the heart-sac grown together. The valves of the heart, also, are frequently diseased.

Symptoms.—This disease is not readily recognized during life, and is frequently mistaken for disease of the valves with its attendant evils, or for an aneurism of the artery coming from the heart (aorta). In some of the cases, particularly when the pouch is of small size, the fatal rupture has been the first evidence of the disease. In others, in which the sac is larger and more marked, the interference with the action of the heart and with the circulation is similar to what obtains in valvular disease. However, the sense of pain and distress in the heart is apt to be greater in aneurism of the heart than in valvular disease.

It has occurred that the blood has coagulated in the sac and and thus worked a cure. Death, however, is the general termination, either owing to a rupture of the sac and fatal hemorrhage, or to compression of the heart; or in the same manner as obtains in valvular diseases.

Causes.—It is more frequent in males than in females, and occurs especially between twenty and fifty years of age, though it is possible at an earlier or a later date. Articular rheumatism and the attendant inflammation of the heart are chief among the causes.

Treatment.—This must be directed against the symptoms, and demands professional skill.

Diseases of the Arteries.

The arteries, fortunately, have but few diseases. Of these the most prominent are aneurism and the condition known as deforming inflammation (endarteriitis deformans). Inflammation of the inner coat of the arteries is characterized by the appearance of small, hard, rather transparent-looking patches, which are raised above the surrounding parts, and on section best show the increase in thickness. It is found to be due to an increase of cells in this portion. Later, these cells become fatty, sometimes even forming a little mushy spot, which finally opens into the artery. This at times leaves a little ulcer which may heal, or it may allow the formation of a variety of aneurism called *dissecting*, because the blood getting between the coats of the artery, tears them apart, and finally returns to the cavity of the vessel at another point, or, more frequently, bursts externally.

At other times, instead of the softening process in these transparent-looking patches, calcification may occur, and the inner coat of the artery become coated with bone-like plates. On these and on the ulcers, fibrin may be deposited, forming thrombi, which shall later furnish emboli (see **Embolism** and **Thrombosis**). The artery, in this disease, when advanced, is dilated, and its walls are more or less thin. This process is also one of the frequent causes of aneurism,* owing to the resulting diminution of the elasticity of the middle coat. In the smaller arteries of the brain, especially in syphilis, it may lead to more complete obstruction, and thus occasion symptoms of impaired function, usually considered as softening of the brain. In the extremities it may either directly, or as a result of the formation of a clot in the vessel (thrombosis), cause gangrene (death) of the limb.

Fatty degeneration of the small arteries may happen, independent of inflammation, and occasion such weakness of the vessel, as to allow its rupture, for example, in the brain. In the larger vessel it produces yellow or whitish patches on the inner surface. At other times there may be calcification of the arteries independent of any preceding inflammation. This is best seen in the middle coat of the arteries of medium size. In this trouble the arteries may be converted into rigid tubes which may be recognized by the presence of hard bone-like rings. This is due to the infiltration of the middle or muscular coat with certain salts, phosphate and carbonate of lime especially. It is a disease of advanced life, and may lead to imperfect circulation.

Waxy degeneration of the different organs of the body is usually due to a change of the blood-vessels as the starting-point, especially of the small arteries and capillaries. For a description of this change see Waxy Degeneration of Kidney and Spleen.

Diseases of the Lymphatics.

There is but little to be said of this class of diseases in a work of this kind. In the description of the diseases of the different organs, under the head of **Tumors** and of **Inflammation,** most that has any interest may be said. The finer lymphatics forming spaces in the tissues, take part in inflammations. The acute inflammation of the larger vessels of the skin is probably familiar to many readers. As a result of some irritation, such as a small boil, a slight wound somewhat inflamed, etc., there is seen a red line or lines running from this point to the bend of the elbow or

[* See Chapter on General Surgical Affections for a description of **Aneurism.**—ED.]

to the armpit in the upper extremity, or to the back of the knee or the groin in the lower extremity. These lines are a little raised, have a slight corded feeling, and at the inner side of the elbow or back of the knee, or in the armpit or groin, a painful swelling or lump can be felt. At times a small abscess may form in their course, or the painful tumor or swelling may have matter formed in it, and will finally burst, or it may be opened by the surgeon. This is one of the annoyances to which medical students and physicians who make post-mortem examinations are particularly subject, and constitutes a part of what are called dissecting wounds. This disease is inflammation of the lymphatic vessels, and is technically called lymphangitis, or angeioleucitis.

Treatment.—Remove, as far as possible, all source of irritation from the causative wound or sore. It is a good plan, if some slight scratch or fester is becoming red or inflamed, to paint it with the tincture of iodine, or with a solution of nitrate of silver, of the strength of five grains to an ounce of water. If red lines extend from the sore or wound in the directions mentioned, coat them and the surrounding parts with tincture of iodine, and just above the termination of the red line paint a circle around the limb. Where a sore on the foot, as a fester from tight shoes, etc., has led to the development of this disease, rest, with the foot elevated, is necessary. In some forms of puerperal (childbed) fever, the lymphatics of the womb become inflamed, and may contain those little disease-producing organisms called bacteria. These bacteria may be present in the lymphatics in other erysipelatous inflammations. The description of these events falls under the head of **Pyæmia** and **Erysipelas.**

The disease called *hypertrophy of the tongue* (makroglossie) is largely made up by dilatations of lymphatic vessels. In *elephantiasis,* there is also a considerable enlargement of these vessels.

So, also, in some enlargements of the privates, dilatation of the lymphatics may form a marked feature. At times an opening on the skin communicates with a lymph vessel which has been dilated, leading to a flow of the lymph—*lymphorrhœa* is the scientific term. *Tubercles* may be found in the lymphatics in connection with ulcers, preferably in phthisis (consumption of the lungs, bowels, etc.). The reader has previously been referred to the article on **Tumors** for a statement of the method of propagation of malignant disease.

Diseases of the Veins.

Inflammation of the veins was formerly considered a much more frequent event than it is at the present time. In each in-

stance that a clot (thrombus) was found in a vein, it was supposed that its formation had been preceded by inflammation. Physicians, at the present time, generally hold the view that, in many cases, the clot is the cause and not the result of the inflammation. The truth lies, to a certain extent, between these extremes. An inflammation outside of a vein (periphlebitis) may produce a clot in the interior of the vessel, and that in turn give rise to inflammation of the vein itself. We have already considered this under the head of **Thrombosis** and **Embolism.**

The veins are liable to become *varicose.* This is seen in the veins of the leg and thigh. Large blue trunks variously twisted are seen raising the skin, and, where markedly developed, the tissues covering them are much thinned. This disease consists in a dilatation of the coat of the veins, first on one side, then on the other of the affected vessels, so that, in its course, it looks knotty.

The three things which may result are, swelling, ulceration of the limb, and hemorrhage.

Causes.—Varicose veins occur especially in women and in those people engaged in occupations which require them to stand most of the time. Constipation aids in producing the disease. Childbearing is, however, the most prominent cause. The enlarged womb pressing on the veins in the abdomen, and thus obstructing the circulation, the blood sets back and dilates the veins in the lower extremities.

Treatment.—An elastic stocking or bandage should be worn to give support to the veins. People who notice the disease commencing might prevent its increase by adopting this measure. The bowels should be kept open daily. The affected limb should be elevated frequently so as to prevent, as far as possible, overdistention of the blood-vessels. This is readily done by occasionally lying down and raising the limb above the head. If a vein ruptures, the person should instantly lie on his back, raise the limb above the head, and then press with the fingers, or a folded cloth of any kind on the vessel at the point of opening. This will stop the flow of blood. Constriction of the limb above the opening is not proper, for that tends to produce a flow of blood from a *vein*, though it may stop that from an artery.

Leucocythæmia or Leukæmia.

The first of these terms means white-cell blood, the second, white blood: they both refer to the same disease, the names having been given by different observers.

An examination shows that either the spleen or the lymphatic glands are enlarged, or else that the bone marrow has become altered. Hence we have a splenic, a glandular, and a myelogenic (marrow) type of the disease, or all these varieties may coexist. The spleen, instead of having its usual weight (less than half a pound), may be so increased in size as to weigh five, seven, ten, or even eighteen pounds. The lymphatic glands, in different situations, as in the neck or armpit, instead of being little kernels, scarcely perceptible, or feeling like little peas, may attain the size of a marble, a pigeon's egg, or even larger, and, when a group of glands becomes enlarged, they may be connected together in a large, uneven mass. The liver is often found enlarged, and, at times, glandular growths appear in this organ, as well as in the lungs, kidneys, etc. At the same time the blood may become so white, as in the case where an observer, when the heart was opened after death, thought that an abscess had been cut; usually, however, the change in color is not so great.

Symptoms.—The marked symptoms are pallor, debility, gradually increasing, perhaps attended with bleeding from the nose, stomach, or bowels, the hemorrhage from the nose being by far the most frequent. At the outset of certain cases a pain has been present in the left side, or the spleen has been found enlarged, forming a tumor, projecting from under the left ribs. In other cases lumps have been noticed in the neck, armpit, or groin, in connection with the symptoms above mentioned. The distinguishing feature, however, is afforded by a microscopic examination of the blood. This disease is characterized by an increase of the white blood-globules and a diminution of the red. Normally, there should be about one white blood-globule to three hundred red, though this is a matter subject to variations. In leucocythæmia the white blood-globules may be equally as numerous as the red, or as one to two; or somewhat in excess of one to twenty. In the latter part of the disease the pallor becomes more marked, the bleedings, perhaps, are more frequent, the sight, possibly, is affected from changes in the sensitive membrane of the eye, fever develops, dropsy may occur, and frequently, by the addition of some intercurrent disease, death results.

Causes.—The disease may occur at any time of life; most frequently between the ages of twenty and fifty years; and is more often observed in males than in females. Malarial fever has preceded it in a certain number of cases; injury to bone has also happened in others, but we are unable to say why, in one case, this disease should occur, while so many in similar circumstances escape unaffected.

Very few recover from the complaint. The disease may end within a year, or extend its march over several years—five, or even more. Death may result from an intercurrent affection, as pneumonia, or pleurisy; or be due to hemorrhage in the brain, or from the nose or stomach, etc. Generally, however, the debility entailed by the malady is the occasion of the fatal termination.

The disease is to be distinguished from other enlargements of the spleen, as malarial, etc., attended with pallor and general debility. Enlarged lymphatic glands also may occur from scrofula, from another condition like leucocythæmia, and called pseudo-leukæmia, from syphilis, and also in the course of a malignant disease, such as cancer. An examination of the blood with the microscope is the best method, and the only one by means of which the presence of the disease can positively be ascertained. The only trouble is, that red blood globules may be mistaken for white ones, or, a slight increase of white blood-globules, which occurs in a number of other conditions, may be supposed to indicate this complaint.

Treatment.—This disease is best treated by maintaining the nutrition and strength of the patient. The medicines which have been supposed to be effective are phosphorus, quinine, and, in one case where it coincided with syphilis, a mercurial. Transfusion of blood has also succeeded in some cases, according to published accounts.

E. G. JANEWAY, M.D.

Diseases of the Bones and Joints.

BY

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DISEASES OF BONES AND JOINTS.

ENTIRELY apart from their often fatal and usually exquisitely painful nature, this class of diseases possesses an importance of its own, from the fact that its victims are, even if life is spared and health restored, apt to be left deformed and helpless, unable to earn their daily bread, an encumbrance on their friends or society, and a constant mortification to themselves.

The attempt to treat these affections without the aid of a physician should never be made unless unavoidable. And indeed they are, for the most part, so gradual in their invasion, and so slow in their progress, that they rarely present those sudden emergencies which call for immediate domestic interference. There is, therefore, little room, in a treatise like the present, for detailed instructions in regard to treatment. But, notwithstanding this, such affections have a most important place here, from the fact that so much depends upon their early recognition. Premature death, or life-long deformity, with weary years of bodily anguish, and still sharper agony of mind, are the penalties of the failure to discover their existence *while they are still susceptible of complete cure;* by which is meant restoration of health without deformity. It will, therefore, be the special aim of the following pages to present their distinctive symptoms in so plain and intelligible a manner that any parent who will take the trouble to read the descriptions attentively, will be able to arrive at a tolerably correct conclusion in regard to the condition of a child who repeatedly manifests *pain or discomfort on moving or being moved.* This may be set down as the first and most general symptom of commencing trouble in a joint or bone, and should always lead to careful examination. And as such affections commonly depend for their immediate cause upon a hurt, careful inquiry should first be made of the sufferer (if of an age to give information), and of his friends or playmates,* of any

* The statements of a nurse are, for obvious reasons, not always to be depended on.

possible source of injury, such as a blow, a fall, a wrench, or a jar. No accident of this kind should be deemed too trifling to be considered, and it would be well to make a written memorandum of any such circumstance for the use of a surgeon in forming his own judgment of the case.

If we except *cancer*, which we shall not consider, and *tubercle*, the existence of which, in bone, is doubtful, we may say that there are but two diseased conditions to which bone is liable, namely: Inflammation and Defective Nutrition.

Inflammation may be either acute or chronic.

Acute inflammation of a bone, whether seated in its covering membrane (the *periosteum*), or in the hard portion of the shaft, or the spongy portion of the joint end, or the marrow of its canal, is always an alarming affection, coming on suddenly, with chills, high fever, headache, often with delirium, frightful pain, and, usually, tenderness at the seat of disease. A physician will always be summoned at once, and active operative measures are often demanded to save life.

Chronic inflammation is either the result of an attack of acute inflammation, imperfectly recovered from, or comes on slowly, with slight occasional or daily recurring fever of a hectic character (see Glossary), pain more or less severe (often not in the part affected), lassitude, loss of appetite, emaciation, night-sweats, and disorders of the digestive system; in short, all the symptoms which characterize consumption of the lungs except the cough. Hence many physicians have been led to look upon it as being necessarily strumous (scrofulous) or tubercular in its origin and nature. Modern experience in the employment of improved mechanical modes of treatment, however, demonstrating that with relief of the local disease, the general health is restored, has given a severe shock to this theory, and places this class of cases in a much more hopeful light.

Chronic inflammation of bony tissue may result in *hardening*, a peculiar and rather rare termination, which is simply mentioned: in *softening* or *ulceration*, technically called *caries;* or in *gangrene* or death of the portion attacked, to which surgeons give the name of *necrosis*. The process of ulceration may be *dry*, when the softened bone-tissue is simply absorbed and carried away in the blood: or *moist* or *suppurative*, when matter or pus is formed. This matter collecting in any quantity constitutes what is called an *abscess*. If it pushes its way to the surface and is discharged either spontaneously or artificially, it usually establishes a running sore.

General Description of Joints.

A joint is the place where two or more bones are naturally joined together, for the purpose of allowing motion between the different parts of the body. The bones are tied firmly together by excessively strong cords and bands called ligaments. But although held together so tightly, the ends of the bones do not touch each other. If they did, they would soon wear off. The joint end of each bone is covered with an elastic cushion or spring of gristle, called by anatomists *cartilage*, which forms a complete protection to the bone. But for these springs, of which there are not less than thirty between the sole of the foot and the head,

FIG. 163.

FIG. 164.

FIGURE 163.—Section through a knee-joint which has previously been distended with air and dried, so as to show the limits of its cavities.

FIGURE 164.—A section through the hind and upper part of the shaft of a thigh-bone (*femur*) and through its socket on the side of a hip-bone. The illustration shows the spongy character of the extremity of the bone and the arrangement of the bony fibres, so that the greatest strength is secured with the least amount of material. The capsule, or sac in which the joint is enclosed, is also shown as it passes from the margin of the *acetabulum* to be attached about the neck of the thigh-bone (*femur*).

every step that we take would communicate such a shock to the brain, that we should all very quickly suffer injury. But no tissue could stand the wear and tear to which a joint is subjected, without a lubricating fluid, like the oil for the axle of a wheel. This is furnished by a delicate membrane, which lines the sides of the joint all around, and is constantly pouring out, in just such

quantities as are required by the work which is being done, a clear oily fluid, called *synovia*. This membrane is called the *synovial membrane*. The essential parts of every joint, therefore, are bone, cartilage, ligament, and synovial membrane.

But notwithstanding these admirable precautions, the amount of wear and tear on joints is still great. To diminish it yet more, the bone is spread out at the end, in order to afford as large a surface of contact as possible, thus, of course, lessening the pressure and friction at any one point. In thus spreading out, its tissue naturally becomes looser, and its fibres more separate; and into the spaces between the bone-fibres and bone-cells penetrate the blood-vessels, always on the alert for work. Provision is thus made for a supply of blood amply adequate to the complete repair of the constantly wearing-out cartilage, and the steady manufacture of fresh synovia. Those portions of a bone which are thus loose in texture, and full of blood, we call *spongy*. It will readily be understood that bone of this kind is more easily injured, and more liable to inflame when injured than is the hard, ivory-like structure which forms the *shaft* or principal portion of the length of the bone.

To these two facts, namely, the soft, spongy character of the bones, constituting a joint, and their exposure to wear and to shock, it is owing that bones are vastly more liable to become diseased at their joint ends than elsewhere.

The joints most liable to disease, and to which, as types, we shall confine our attention, are the spine (which is simply a long compound joint), the hip, the knee, and the ankle.

Anatomy of the Spine.

The spine differs from the other joints in having, in its most essential part, and that in which disease almost invariably commences, no synovial membrane. Hence, in considering its diseases, we may leave that element out of the question. It is composed of twenty-four rounded blocks of spongy bone, called vertebras, the cartilage on the under surface of each of which is attached to the upper surface of the one next below. These cartilaginous discs are from one-eighth to five-eighths of an inch in thickness. Instead of being firm and hard all the way through, like the cartilages of other joints, they are, in their interior, quite soft and pulpy; a fact which adds greatly to their elasticity. Taken together, they form about one-fourth of the entire column. The motion between any two of the bones, thus united, must of course be very limited, but their large number makes the entire joint capable of a great range of motion in all directions.

Each vertebral body opens out behind into a strong, hard ring of bone, which, in combination with its fellows, forms a continuous canal, giving passage and affording protection to that prolongation of the brain which is called, from its position, the *spinal*

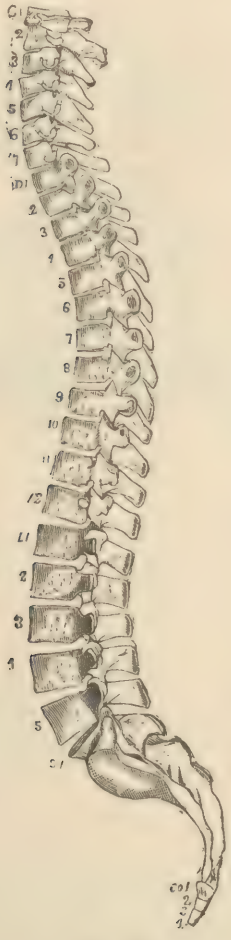

FIG. 165.

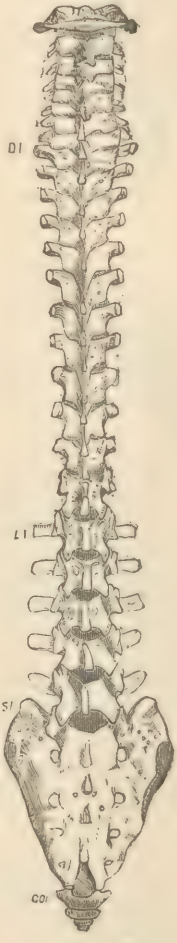

FIG. 166.

FIGURE 165.—The bones of the spinal column as seen from the left side. The numbers refer to the vertebræ of the different regions.

FIGURE 166.—The bones of the spinal column as seen from behind.

cord. From both sides of this ring, close to the body, project little branches, a short one upward, and a longer one downward, which form true joints with similar projections on the vertebras next above and below, and act both as auxiliary supports, and as stops to prevent too great motion backward. Behind these joint-

branches, on each side, the ring carries a long, stout arm which stands out backwards at an angle of about 45°, for the attachment of the muscles of the spine. Finally, from the back of this ring

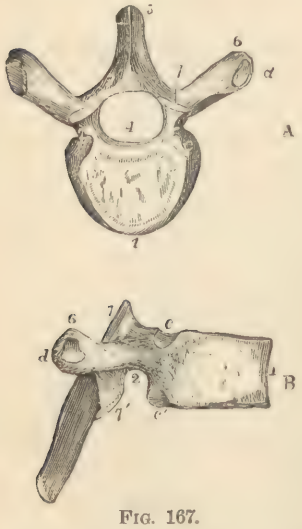

FIG. 167.

FIG. 168.

FIGURE 167.—A vertebra of the neck, seen from above (A) and from the right side (B).
FIGURE 168.—The tenth, eleventh, and twelfth (and last) dorsal vertebræ as seen from the left side. The numbers are placed on the bodies of the bones. To the right are seen the smooth surfaces giving attachment to the heads of the ribs. The bones are represented as being stripped of the ligaments, cartilages, and all other soft parts. The spaces between the bodies of the bones are those filled by the intervertebral cartilages.

projects a long, slender branch or *spine*, also designed to give attachment to muscles and ligaments. The points of these spines are what we feel in passing the hand down the back, and they give its name to the whole column.

Diseases of the Spine

are usually called, in consequence of the results which they invariably lead to if not arrested in their earliest stage, *spinal curvatures*. They are divided, in accordance with the form and direction of the curve, into *Angular* or *Posterior curvatures*, *Anterior curvatures*, and *Lateral curvatures*. Angular curvature is also known as *Pott's Disease*, from Dr. Percival Pott, an English surgeon, who first described it as a distinct affection; and as *Caries of the Spine*, a descriptive title indicating the condition of the bone when the disease has made considerable progress. Lateral curvature is sometimes more distinctively denominated as *Rotary Lateral Curvature*, owing to the fact that the spine turns on its axis as well

as bends sidewise ; and as *Double* or *Sigmoid Curvature*, because it curves in two directions, assuming a fancied resemblance to an inverted letter S, the Greek name for this letter being *sigma*. Angular and lateral curvatures are sufficiently distinctive and intelligible terms, and we shall confine ourselves to their use.

The essential distinction between the two diseases consists in this : In angular curvature the bones and cartilages are being destroyed, eaten away, melted down, by a process of active inflammation and ulceration taking place at one point. At this point

Fig. 169.

Fig. 170.

Fig. 171.

Figure 169.—Diagram of lateral curvature.
Figure 170.—Bones of the spinal column in a case of lateral curvature.
Figure 171.—Vertebræ showing the results of caries of two of their number.

an abrupt change of form ensues, properly enough described as *angular*, and as this usually projects backward, it is also naturally called *posterior*. In lateral curvature, on the contrary, there is no such destructive process going on. There is simply a condition of debility, in which the spine yields, in long gradual curves, to a force exerted along its entire length, either the weight of the head and body, or muscular contraction. The former is, therefore, essentially much the more dangerous and painful disease, although in its earliest stage not less amenable to treatment. It will readily

be understood of what paramount importance it is to recognize the existence of this terrible malady at the very outset, before any disintegration of tissue has occurred. With this object we proceed to consider the diagnosis, or, in simpler phrase,

The Detection of Angular Curvature.

We assume, as is usually, though by no means invariably, the case, that the patient is a child between four and twelve years old. He has, in nine cases out of ten, either recently recovered from whooping-cough of unusual severity, or has had an injury of more or less gravity, or, as frequently happens, the latter following the former. The first thing which the parents notice as being out of the usual way is a certain squareness and stiffness of the shoulders, and general awkwardness of carriage and gait. Taking the place of his previous perfect freedom and recklessness of motion, is a careful, constrained mode of walking, like that of a decrepit old man. He gives up jumping, and even avoids stepping quickly down. Every sudden jar evidently causes him discomfort if not absolute pain. He chooses the smoothest ways, and walks around obstacles. His feet are held rather far apart, and one or both toes are turned in. The head is probably tilted slightly backward. The motive for this carriage is preservation of equilibrium and avoidance of shock.

He soon begins to complain of sudden attacks of pain in the side, stomach, or bowels, most commonly centred about the navel. These are often of the most excruciating character, causing him to double up, or even to fall as if shot, and eliciting piercing cries, but lasting only a short time, and often ceasing as abruptly as they began. They are usually caused by an unguarded movement on the part of the patient, or shock communicated from outside, as by being suddenly lifted, or from the jolting of a vehicle. Being situated in or near the stomach, they are commonly supposed to be produced by worms or indigestion, or inflammation of the stomach or colon, and much valuable time is wasted in experimental treatment for their relief, based upon these ideas.

Another symptom makes its appearance about the same time, which, taken in connection with those already described, should, however, prevent any such unfortunate and fatal error. This is *morning rigidity*. The child on first waking in the morning is greatly disinclined to stand erect and bear his weight on his feet; sitting in a stooping posture on the side of the bed: appearing very fretful and irritable, and especially averse to putting on his stockings and shoes, as the effort to stoop forward is

painful. In other words, the spine is rigid in a slightly stooping attitude, and will not bend either forward or backward without discomfort. This gradually wears off later in the day, but it will still be found that the patient avoids stooping, and if directed to pick up an object from the floor, will approach it sideways, bending the knees only, and holding the back quite stiff. Many a little sufferer is punished for what is ignorantly supposed to be laziness or crossness on waking up in the morning, who is, in reality, in the incipient stages of this distressing malady.

There are other symptoms which are more or less peculiar to the disease in certain parts of the spinal column. When in the neck, the head is apt to be thrown back, unless paralysis has taken place, which it sometimes does very early, and then the patient will be powerless to hold the head up. It will fall forward or upon the shoulder, and at the same time he may be entirely deprived of the use of his limbs. When situated in either the neck or the upper part of the back, the breathing is short, jerky, and often accompanied with a slight grunt ; and persistent and distressing hiccough is of frequent occurrence. When in the lower part of the back, the pain often travels around the crest of the hip, or down into one of the legs ; and there is not infrequently a contraction or drawing up of an important muscle which runs from the front of the spine, about opposite the small of the back, down to the upper part of the thigh, and which is known as the *psoas* muscle. This contraction inclines the child to keep the knee of that side somewhat drawn up when lying in bed, but when standing, it draws the spine inward, making him hollow-backed, and also may draw it to one side, so that a careless observer will mistake the case for one of lateral curvature. The attendant symptoms are so different, however, that this error is unpardonable.

We must be on our guard against the universally prevalent error, that true spinal disease is accompanied by pain in the spine or back. *This is never significant of its early stage*, and indeed scarcely ever accompanies it. Hence, if we delay our decision for this supposed sign to make its appearance, we shall lose time which can never be made up. Nor is tenderness on pressure any more to be depended on. So far from its occurrence being a sign of this disease, firm pressure actually relieves the discomfort, and produces a sense of great relief. Let the child be laid, face downward, on the lap of the examiner, and let the latter slowly separate his knees, and at the same time make gentle pressure upon the spine. All signs of previous discomfort—and prominent among them, the distressed breathing—will, if they are dependent upon spinal disease, cease as if by magic. The reason of this will

readily be comprehended by glancing at the annexed diagrams. The point at which the disease almost invariably commences is the front part of the upper or under surface of the body of a vertebra, or the connecting cartilage. Any force which brings these

Fig. 172.

Fig. 173.

Figure 172.—Two lumbar vertebræ, showing the position of the bodies of the bones when the spine is bent forward.

Figure 173.—Two dorsal vertebræ, showing their position when the spine is erect.

bodies closer together, therefore, will evidently produce pain, while any force which separates them will give relief. It needs no mathematical demonstration to prove that pressure on the points of the spinous projections (which form the portion of the spine felt in passing the hand down the back) will open rather than close the space in which, like a finger caught in the hinge of a door, the inflamed portion is being compressed and crushed. This fact of relief being afforded by extension and pressure upon the spine, as indicated by improved breathing, is of very great value in enabling us to come to a conclusion as to the nature of the disease in the case of infants who can afford no assistance themselves to our diagnosis.

Figure 174.—An aggravated case of angular curvature of the spine.

When these symptoms, or some of them, have continued a varying time, from a month to a year, or even two or three years, the destruction of tissue in the front of the spine allows it to tilt forward, and causes the spinous projection at that point to become prominent behind. This shows itself at first as a mere little knuckle of bone; but no matter how small it is, it possesses the gravest significance, as indicating that an amount of tissue has been destroyed which can never be wholly replaced.

There is one spinous projection, on a level with the top of the shoulders, which is naturally so much more prominent than the others, that its vertebra is known as the *prominent vertebra*. A similar projection anywhere else along the spine, is an indication either of original malformation, which is rare, or of serious disease. A slight lateral curvature of the spine may, especially in women, be consistent with health : an abrupt projection backward, however trifling, never is. But, if parents and physician are properly alert, the disease will have been arrested before any such tell-tale of its ravages appears. And this leads us to consider the

FIGURE 175. — Mode of using the spinal swing.

Treatment to be adopted to procure this very desirable result—a result which would make the sad spectacles of gibbous deformity, which now so constantly pain the eye, almost a thing of the past. One of the old names for this affection, in its aggravated stages, was "*broken back.*" Now it is in considering it as this—and nothing else or more than this—and treating it as such, no matter what its cause may have been, that the secret of its successful management consists.

The indications for the care of a fractured limb, with bruising and crushing of the bone, are the indications for the treatment of a spine in which ulcerative inflammation has its seat. What are these indications ? *First*, to restore the part, as nearly as possible, to its natural relations of form and position ; *secondly*, to maintain it in that position ; *thirdly*, to prevent all motion, friction, and irritative pressure between the fractured ends of the bone ; *fourthly*, to make such local applications as will tend to diminish inflammation and promote a healthy circulation in the diseased tissues ; and *lastly*, and of least importance, although not to be neglected, to administer such internal remedies as the general condition of the patient seems to call for. To make this last object the first, either in point of time or of value, is to commit an error which cannot be too seriously deprecated.

Mere rest in bed, although useful in *partially* fulfilling the me-

chanical indications, is by no means sufficient; and its effects upon the general health, from the deprivation of fresh air, sunlight, and exercise, the three great factors in the renewal as well as the preservation of health, may be disastrous. Its proposal, save as a temporary expedient, must be at once rejected.

FIGURE 176.—Taylor's splint applied in a case where the disease is in the upper part of the spine.

In accomplishing our first proposed end, namely, placing the spine in its natural form and relations, we cannot fully carry out the analogy with the fractured limb, from the fact that we cannot produce the rectification all at once. Both on account of the character of the tissues involved, and for fear of injuring the spinal cord, which runs the whole length of the spinal canal, and whose integrity is essential to life, locomotion, and sensation, we must proceed by degrees. The most efficient appliance for this purpose, that is, direct extension or straightening of the spine by traction, is the spinal swing, in which the patient draws himself up by the head, while the weight of the body and of the limbs, below the seat of disease, acts as an extending force. The whole movement being under the patient's own control, he uses no more force than is entirely agreeable to him. It is necessary to check rather than to urge him in its use, so great is the sense of relief which it gives.

The best splint for maintaining the parts in position, and preventing hurtful motion and pressure, is that of Dr. Charles F. Taylor, of New York. It consists simply of two steel bars, passing up and down the spine, one on each side, hinged and padded opposite the seat of disease, and held in position by shoulder straps above, and a hip-band below. Its action is that of a lever, with the fulcrum at the point of deformity, actual or threatened, and it results in lifting apart the diseased vertebræ, by throwing the weight upon the oblique projections shown in the figure of the vertebra on a foregoing page.

Where it seems necessary to confine the motion of the ribs to

a considerable degree, or to make use of an elevating action from the hips, the raw hide jacket of Mr. S. A. Darrach, of Newark, N. J., leaves little to be desired. All of these objects are very perfectly attained by the method recently advocated by Prof. L. A.

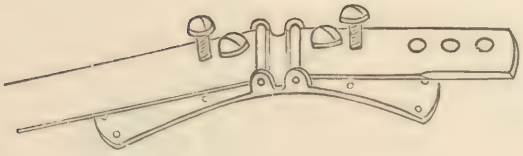

FIG. 177.

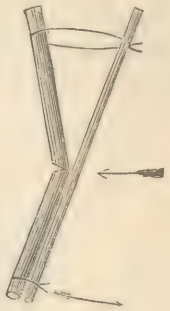

FIG. 178.

FIGURE 177.—The arrangement of hinges, levers, pads, and screws by means of which pressure is made over the transverse processes of the vertebræ in Taylor's splint.

FIGURE 178.—Diagram showing the mode by which the splint brings the distorted spine into a correct position. The broken stick represents the diseased spine, and the straight stick a splint applied for its support. The string tied about their lower ends holds them together, and by tightening the loop surrounding the upper ends, the angle at the point of fracture will be made to disappear.

Sayre, of New York, of surrounding the body with a plaster-of-Paris bandage reinforced with light tin splints, exactly as a fractured limb would be put up, extension being maintained during its application by the spinal swing. This plan has in its favor extreme economy, facility for everywhere obtaining the necessary materials, and great efficiency. There are objections to it on the score of retention of the excretions of the skin, interference with respiration and the action of the heart, together with its weight, and liability to crumble.

These objections are met, to a great extent, in the adaptable porous spinal jacket, of Mr. Johnstone, of Philadelphia. The material of which this appliance is composed is felt stiffened with gum. It has the advantage of allowing the air to pass freely through it, thus permitting the exhalations from the surface to escape, and is at the same time sufficiently rigid to afford adequate support. The jacket is laced up the front like a corset, and can therefore be removed to meet the demands of cleanliness. In order to have such a jacket made, a plaster jacket or cast must first be taken, the patient being stretched either by the spinal swing or in the horizontal posture, the latter being less painful. From this cast, which is sent to the manufacturer, a solid plaster mould is made. This is the exact counterpart of the patient's

body in its improved position ; and on this plaster body the felt is accurately adapted while softened by steam. This appliance is very much lighter than the plaster jacket, and is usually worn with much comfort.

A very useful apparatus for aiding locomotion and promoting extension in these cases is Darrach's wheel crutch, with head suspensory. Extension may also be kept up by means of apparatus attached to a chair, and worked with a ratchet and key.

The best local remedy for reducing inflammatory action is dry

Fig. 179.

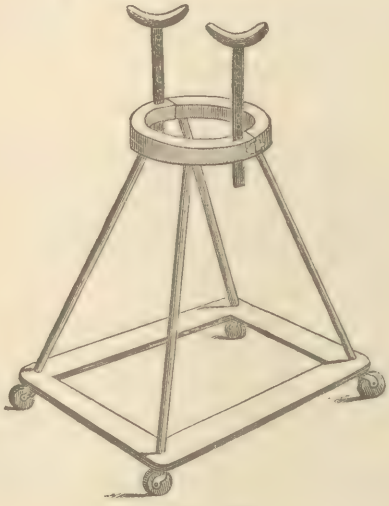

Fig. 180.

Figure 179.—Darrach's patent wheel-crutch.

Figure 180.—A simple form of wheel-crutch in which the rests for the arms can be adjusted to varying heights, and in which the ring surrounding the body is made to open for the admission of the patient.

cold, applied by means of the *spinal ice-bag*, followed by a very brief application of heat.

To improve the circulation and nutrition of the part affected, nothing is more effective than gentle and long-continued friction and kneading of the back, with vaseline, cosmoline, camphorated oil, or other lubricant.

The general medicinal treatment must be determined by the patient's condition. It may, however, be suggested that tonics soon lose their effect in these cases, unless the mucous membrane of the alimentary canal is freshened by occasional mild purgation.

To sum up: Angular curvature of the spine is a destructive or ulcerative inflammation of the bodies of one or more vertebræ, usually resulting from external injury or whooping-cough, characterized in its earlier stages by a stiff, awkward gait and carriage, by impossibility of bending the back, by morning rigidity, by frequent attacks of severe spasmodic pain in the abdomen in-

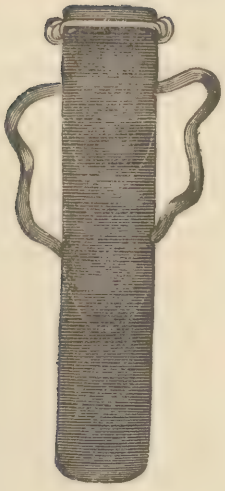

FIG. 181.

FIG. 182.

FIGURE 181.—India-rubber bag, made in three compartments, for applying pounded ice to the back.

FIGURE 182.—Apparatus attached to a chair, for making extension in a case of angular curvature of the spine.

duced by motion, by short, jerking respiration and protracted and painful hiccough, by the turning in of the toes of one or both feet, and sometimes by loss of power in the limbs and impaired digestion. It is to be treated by mechanical appliances, which will extend and straighten the spine, and diminish the pressure between the diseased surfaces until new bone can be made, and by attention to the general health, and the administration of the lime phosphates.

Lateral Curvature of the Spine.

The detection of this affection in its incipient stage is also of the greatest importance. It usually occurs in girls between the ages of twelve and sixteen years, during the period of womanly development and rapid growth. It begins with lassitude, disinclination to vigorous exertion, and a tendency to stoop, the spinal muscles seeming too weak to support the frame erect. Its characteristic pain is one of a dull aching or burning character, quite constant, not paroxysmal or spasmodic like that of angular curvature, situated under the point of one shoulder-blade, usually the right. But this is often not developed at the very outset. The general health is rarely seriously impaired. A slight difference in the height or size of the shoulders or hips, or both, is early noticed by the mother or the dress-maker. (See Figure 183.) These are often made light of, as dependent upon a "bad habit" in standing or sitting, especially in sitting at the desk in school. In point of fact the habit is the *result*, not the *cause* of the loss of symmetry; and, instead of making the child's life a burden by constantly nagging and reproving her for it, appropriate means should at once be taken to remedy the deformity. They cannot be initiated too early. When such a condition as above described exists, it becomes important to determine its exact nature. To this end let the entire back be exposed to view in a strong light. If there be a true *f*-shaped curvature commencing, but not yet arrived at that characteristic stage when the eye recognizes it at a glance, from the sinuous double curve, rotation or twisting of the spine will already have begun. To test this, pass the two forefingers down the spine, one on either side, half an inch outside of the line of the spinous projections. If they move along, side by side, exactly upon the same level from the top of the spine to the bottom, there is no rotation, and true lateral curvature does not exist. Rest from brain-work, open-air exercise—if possible, in the country—and attention to the general health, are probably all that will be required in such a case. But

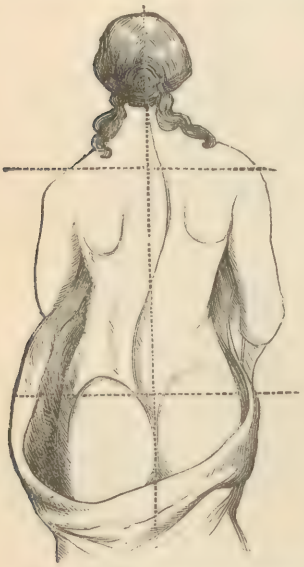

FIGURE 183.—Lateral curvature toward the right.

if, when the fingers reach the point on a line with the middle of the shoulder-blades, one of them, usually the right, is found to be rising above the level of the other toward the examiner, this elevation continuing for two or three inches, and if, as they reach a point about opposite the crest of the hips, the other finger begins to rise

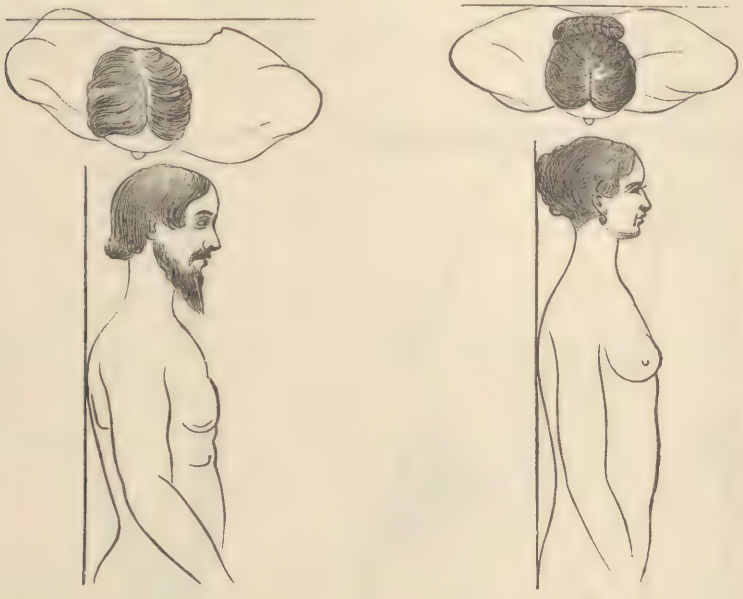

FIGURE 184.—Effect of rotary lateral curvature upon the form of the trunk: A, views from above and one side of a case of curvature; B, views from above and one side of a healthy spine.

in the same way while the first recedes, we may make up our minds that rotation has commenced, and may feel sure that the sigmoid curve will follow, unless prompt and vigorous measures are taken to prevent it.

Treatment.—These measures are essentially the same in principle as those recommended for angular curvature, namely, correction of the improper position of the vertebræ by extension, and maintenance of this improved position by strong mechanical appliances: but with these differences in detail: *First.* Owing to the compound nature of the deformity, suspension must be made, not simply in the direct axis of the spine, but also both laterally and obliquely. *Secondly.* As we have no disease present in the bone-tissue, we can use much greater force without fear of injury, and do not need to guard against occasional relaxation. And *Thirdly.* Certain of the muscles of the trunk and spine being in a weak, relaxed condition, we must, by appropriate exercise, by manipula-

tion, and perhaps by the use of electricity, endeavor to restore their tone and strength. In the early stage just described, the employment of the spinal swing and the application of an antero-posterior splint will generally be all that is demanded. The ladder and the trapeze, both of which can easily be put up in any house, are of the greatest service in this stage, and form valuable means of exercise for all growing youth. When the double curve is once well developed, so that one shoulder projects noticeably

FIG. 185.

FIG. 186.

FIGURE 185.—Vertical suspension by the hands, by means of the trapeze, as used in lateral curvature.

FIGURE 186.—Vertical suspension by the hands, by means of the ladder, as employed in the treatment of lateral curvature.

backward and the front of the chest is advanced on the opposite side, as shown in the diagram, complete restoration of symmetry is rare, and the treatment becomes laborious and complicated, demanding the employment of powerful fixed machinery, and the devotion of several hours daily to its use. The time and labor are well spent, however, if the increasing deformity can be checked before the internal organs have suffered irreparable injury from compression.

In most of our large cities, educated physicians are to be found

who have provided themselves with the mechanical facilities essential to the successful management of this and other distortions of the frame, and who devote their attention more particularly to this department of medical art. In the great centres of European civilization, so much importance is attached to this matter, that institutions of the kind are usually under government patronage.

The employment of exercise in the correction of deformity was first worked up systematically and scientifically by a Swede named Peter Henry Ling, and is somewhat extensively practised as the System of Ling, or the *Swedish Movement Cure*. It has been largely developed since his day, and much ingenious and valuable apparatus has been introduced to take the place of manual assistance, but the principles are essentially those first enunciated by him.*

To sum up: lateral curvature of the spine is a loss of symmetry of the trunk, with lateral deviation of the spine from its normal upright position, and rotation upon its axis, unaccompanied by inflammation or ulceration, but gradually producing a change of shape in the bodies of the vertebræ by absorption from mere unequal pressure; both the lateral deviation and the rotation being double, and the former assuming the shape of a reversed letter S. It is characterized by dull aching or burning pain in the back, usually under the point of the right shoulder-blade, and by debility. Its most significant early sign is a bulging outward of the surface on one side of the spine, usually the right, in its middle third or chest portion, and on the opposite side, though to a less degree, in its lower third or loin region.

Its treatment is extension—direct, oblique, and lateral—pressure against the curves, exercise for the development of the muscles, alternating with rest, and powerful instrumental support.

Diseases of the Hip-Joint—Coxalgia.†

Next to the spine, the hip-joint is that portion of the skeleton which is most liable to injury, and hence to disease. Affections of this joint are even more serious and intractable than those of the vertebræ. The invaluable improvements, however, which have been introduced in their treatment by American surgeons during

* A most interesting exhibit of machinery for this purpose was made at the International Exhibition held at Philadelphia in 1876, by Dr. Gustaf Zander, of Stockholm, founder of the Mechanico-Therapeutic Institution in that city. Dr. Charles F. Taylor, of New York, also exhibited miniature models of such apparatus.

† Painful affection of the hip.

the past quarter of a century, have done much to remove them from the category of almost hopeless cases, to which the older writers consigned them. According as one tissue of the joint or another is the first seat of injury or inflammation—the bone, the cartilage, or the synovial membrane—different names are attached to its diseased conditions; but as they all have one natural termination—destruction of the joint, and are amenable to but one mode of treatment—mechanical protection of the joint, nothing will be gained by going into nice distinctions: and we proceed to give the prominent points in the detection of the disease.

Symptoms.—The first thing to attract attention is usually a slight, but persistent limp. The child inclines to walk and stand with one heel raised from the ground, the knee of the same side

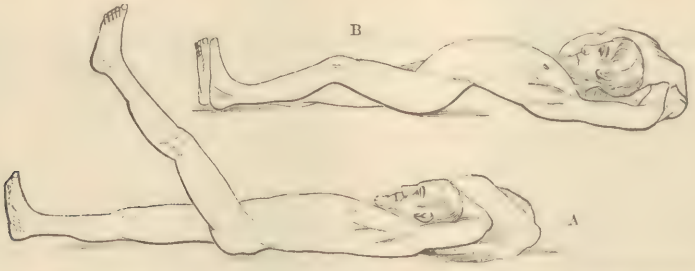

FIGURE 187.—Effect of stretching out the limb in a case of disease of the hip-joint: A, with the thigh raised, the back lies flat upon the floor; B, bringing the knee to the level with the other, causes the back to arch upward.

slightly bent forward, and the toe turned out. For some months nothing more than this may be noticed. Gradually sleep begins to be disturbed during the earlier hours of the night. At first the patient is simply restless, giving little starts like an over-fatigued and nervously excited child; but soon the start is accompanied by a piercing scream, almost like the cry of a dumb animal in pain. He does not, as a rule, awake with the scream, and, if aroused, says that there is nothing the matter with him, and sinks into a quiet slumber, again in a few moments to utter the same inarticulate cry of terror and pain. At the end of about four hours these "starting" pains become less frequent, and the latter part of the night is spent in profound and undisturbed sleep.

Up to this time, the general health may not have suffered materially, and the child may be actually free from pain during the day, and inclined to active exercise. If pain is complained of, it will be in the knee, or in a line running upward from the inside of the knee, obliquely across the front of the thigh. But we must not allow ourselves to be thrown off our guard by the situation of

the pain. The coexistence of these two conditions points unmistakably to serious mischief going on in the hip-joint, and demands immediate interference and persistent attention for at least a year, if we would obviate permanent deformity or lingering death. On stripping the patient, the following additional signs will confirm our suspicions: placing him flat on the back, on a firm, level surface (not a soft bed), we notice that the knee of the affected side is slightly drawn up, or, if he makes an effort to stretch it out beside its fellow, the small of the back is at once arched up. (See Fig. 187, B.) Slipping one hand under this arch, and moving first the sound limb, and then the affected limb up and down with the other hand, we shall find that in the first case the spine remains perfectly quiet, while in the second it is pressed down strongly on the hand when the limb is raised. This is a most important point, as showing that motion does not take place through the hip-joint; the same fact is occasionally noticed in psoas abscess, already mentioned in treating of angular curvature of the spine, for which we must be careful not to mistake it. On comparing the limbs laid carefully side by side, we shall find that the lame one is a little longer than its fellow. Both knees being drawn up, it will be impossible to move the affected limb *in or out* to any extent, without moving the entire body with it. Turning the child upon his face, we shall find that he cannot lie quite as flat upon the affected side as on the other, the leg being slightly drawn up and thrown outward. The buttock, instead of presenting like the opposite one a well-rounded mass of elastic muscle, will be flattened and broadened, as if a heavy weight had pressed it out, and the crease below it will have disappeared. On making pressure with one or two fingers directly behind the head of the thigh-bone, where the flattening is most apparent, the depression which exists

FIGURE 188.—A, a child free from disease of the hip-joint; B, a case of disease of the right hip-joint (early stage) in which the fold of the buttock on the diseased side has became raised and the buttock is smaller than the one on the opposite side.

on the sound side will be found to be more or less completely filled up, and the head of the bone will appear to be somewhat higher than that of the opposite side. The attempt to produce pain by striking upward against the sole of the foot, as a confirmatory sign, is an unnecessary infliction of suffering, as the symptoms already detailed are quite adequate to a decision.

Treatment.—The only treatment for this distressing and often fatal affection consists in drawing down the limb, so that the pressure of the head of the thigh-bone against the socket of the hip may be diminished as much as possible, and the spasmodic contraction of the muscles, which produces the starting pains at night and the excessive deformity, may be completely overcome. This may be accomplished in two ways: *First.* By attaching a weight to the foot by means of adhesive plasters, carried spirally up the limb to the middle of the thigh, the patient lying on his back, with the lower end of the bed raised to prevent him from sliding down, and the cord, by which the weight is fastened to the plasters, passing over a pulley. Less than ten pounds is of little use. The weight must be kept on night and day, and the patient must be confined to his back most of the time. [See page 678, Fig. 280, Vol. I.]

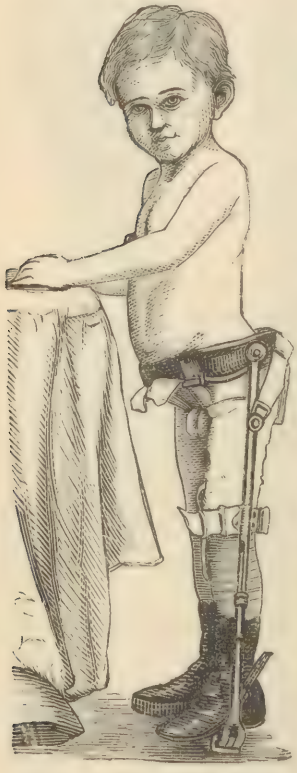

FIGURE 189. — Taylor's hip-splint.

This mode of treatment is open to the grave objection of interfering with the enjoyment of fresh air and exercise, and thus seriously impairing the general health.

Second. By the use of an extension splint. Several such instruments, known as "hip-splints," are used by surgeons—all, modifications of that originally devised by Dr. H. G. Davis, of New York: among which we may mention Davis's, which reaches down to the ankle; Sayre's, which reaches only to the knee; Taylor's, which comes down below the foot; and Pancoast's, which is fastened to the shoe. The first two have been very successful in the hands of their inventors. The third affords the largest space for the application of plasters, and, acting as a crutch, protects the joint from shock more effectually than the others. It is necessary, however, to watch the knee carefully in using it, and see that it does not

become stiff. The fourth is hinged at the knee, which deprives it of much of its power as an extending apparatus, while its attachment to the foot is very imperfect. It is usually applied by the instrument-maker, which fact alone is sufficient to condemn it, as no surgical apparatus should ever be applied in the first instance except by the physician or surgeon.

The local application of ice around the joint, especially just behind it and over the groin, followed by dry heat, as recommended in speaking of spinal caries, will give great relief, and contribute to a cure. The general treatment differs in no respect from that for the disease just mentioned.

To sum up: hip disease is a destructive or ulcerative inflammation of the socket of the hip, or the head of the thigh-bone, or both, usually resulting from external injury, and therefore not necessarily indicating an inherited taint of constitution, characterized in its earlier stages by a limping gait, confined to one limb, the knee of the affected limb being slightly bent forward, the heel raised and the toe turned slightly outward; by attacks of acute, spasmodic pain during sleep, called "starting pains," which cause the patient to shriek out suddenly without necessarily waking; by pain in the knee or along the front of the thigh; by stiffness of the hip-joint, as determined by various tests; by flattening of the buttock and wasting and lengthening of the limb.

It is to be treated by maintaining the limb in a condition of permanent extension, either by weight and pulley, or by a ratchet splint. The latter is greatly preferable, but the former should always be resorted to at once, when there is good reason to suspect the existence of the disease, until a proper instrument can be obtained. Such instrument should be applied only by a physician, and worn under his direct supervision. The local application of dry cold followed by that of heat; the use of the lactophosphate of lime and cod-liver-oil, or malt extract; exercise in the open air and sunlight, with the aid of the wheel-crutch if necessary, constitute the accessory measures, which should be scrupulously carried out, but must never be depended on to the neglect of the mechanical treatment, even in the very earliest stage.

Diseases of other Joints.

All the other true joints are liable to precisely the same diseased conditions which we find in hip-disease. Lying near the surface there is comparatively little difficulty in their detection, and their treatment is to be conducted on the same principles.

The affection to which the *knee* is most liable, and to which it is far more liable than any other joint, is

Inflammation of the Synovial Membrane.

In its *acute form* this disease is characterized by heat, swelling, redness, and excruciating pain through the joint, greatly aggravated by motion. It is accompanied by fever and general disturbance of the system. Its best-known form is rheumatic fever, in which more than one joint is usually affected; but, wherever else it may appear, the knee is rarely spared. The swelling is partly in the tissues about the joint, but is principally due to an increase in the synovial fluid, which is also much altered in quality, in accordance with the nature of the irritant or poison which has produced the inflammation. Under the influence of the irritation, the muscles contract, bending the knee, often to a right angle. The symptoms are always so grave that professional aid will at once be sought.

FIGURE 190. - Deformity of fingers caused by rheumatism of their joints.

Chronic inflammation may be the result of an acute attack, or it may come on gradually and spontaneously. When of rheumatic origin, it produces great stiffness and swelling, due to fibrinous deposits about the joints. When gouty, it leads to deposits of lime, called chalky concretions, sometimes so extensive that all the natural tissues are absorbed, and the sufferer can write his name on a blackboard with his knuckle—the preference of gout being for the fingers and toes. If of a simple and very sluggish character, it causes the effusion of an immense quantity of watery synovia, constituting *Dropsy of the Joints*. This condition is recognized by the great enlargement of the joint in certain directions, its elastic feeling under pressure, and the absence of pain or heat. A similar collection of fluid in the sheath of a tendon close to a joint is called a *ganglion*, and is mentioned farther on in this chapter. One chronic form, however, comes on often so insidiously that its serious nature may remain unsuspected until very sad mischief has been wrought. It is supposed to be scrofulous in its origin, but it is by no means necessary to its occurrence that the sufferer should have before exhibited any of the signs of scrofula. It is commonly known as white swelling, and is to be recognized by the following signs:

Symptoms.—The beginning of this disease is almost painless, and it may continue to present neither decided pain nor tenderness on pressure for many months. The joint is enlarged and shapeless, with an inelastic, boggy feeling under the touch, but, instead of being red, is unnaturally white, having a sort of pearly, translucent hue. There is often a sense of weakness in the knee, and the limb becomes fatigued sooner than its fellow. When pain is present, it is of a dull, aching character, with a sense of fulness. Sometimes the patient complains of intense coldness in the joint. After a time, however, the unhealthy fluid in the joint eats away the cartilages covering the ends of the bones, and the superficial layer of the latter begins to be inflamed and ulcerated. When this happens, we very soon have suffering as a result. The "starting pains," spoken of in treating of hip-disease, come on, the swelling increases, abscesses form, and the joint is often rendered stiff and useless, even if the limb is saved. The general health, of course, sympathizes with the local disturbance, in the same way as in the disease just alluded to.

Treatment.—Whether the inflammation be acute or chronic in its progress, gouty, rheumatic, scrofulous, or purulent in its nature, however caused, in whatever joint developed, demanding what remedies soever, either generally or locally, one means should never be neglected, namely, *fixation* of the affected joint or joints by means of splints, as nearly as possible in the straight position of the limb. In some cases, a stiff splint of wood or metal, carefully padded to fill up irregularities of the surface, as, for instance, the space under the knee-joint—in other cases, an extension splint, like that advised for disease of the hip, will best fulfil the indications; but one form or other is essential. When all motion and friction between the joint-surfaces is thus prevented, the pain begins to diminish, as if by magic, in acute cases; and the whole system to show signs of healthy reaction, in chronic cases.

Rickets

is retarded or imperfect development of the bones. Under its influence they remain soft and cartilaginous much longer than is natural. It is therefore a disease of earliest infancy—in fact, may be said to exist from birth—although often unrecognized until some time after the child begins to walk. Owing to their soft, yielding condition, the bones bend both under pressure and from muscular action. Those of the limbs are thus shortened and curved. The points at which bony tissue is in the natural process of growth most rapidly deposited, become enlarged out of proportion to the

rest of the bone, and indeed actually enlarged. These points are near the joints. Hence the joints appear thickened, especially those of the knee, ankle and wrist. This is, perhaps, most noticeable at the wrist. To this enlarged condition of the ends of both bones forming a joint, the term "double-jointed" is commonly applied. The ribs sink in at the sides, straighten, and project in front, thus forcing out the breast-bone, and producing what is known as "chicken-breast." Where they join the cartilages which connect them with the breast-bone in front, they swell out into little round knobs. The soft spot in the top of the head continues much later than usual, and is often larger than is natural. On the skull, the deposit of bone tissue takes place in irregular patches, leaving depressions or holes in and between them, which sometimes actually perforate the bone. The child is usually very late in getting its teeth. When it begins to walk, the legs curve rapidly, generally forward and outward, producing bow-legs. The spine yields under the weight of the head and arms, bending backward, forward, or, rarely, toward one side, producing a lateral distortion, which, however, exhibits the rotation of true lateral curvature. Occasionally the bones of the limbs not only bend, but break; and, reuniting irregularly, produce very great deformity. One of the most serious results in the female is distortion and narrowing of the pelvis, rendering child-bearing dangerous, if not impossible. Probably owing to the fact that the muscles elongate more rapidly than the bones in such cases, and are thus relaxed and necessarily lose tone, a kind of false paralysis often shows itself. They contract sluggishly and feebly, and those of the lower limbs are not able to support, much less to carry, the body. The deformities resulting from this disease are therefore of the most serious and appalling nature. Hence the

Detection of Rickets, at the earliest possible moment, is of the utmost importance. It is probable that the first thing which will attract the attention of the mother or nurse, beyond the fact that the child is peevish and that its food does not appear to do it as much good as it ought, will be excessive sweating of the head. The pillow will be soaked in an hour or two, night after night, while the perspiration elsewhere will not be unusual. The large size and noticeable pulsation of the soft spot on the top of the head will be observed. The child will roll its head from side to side, often making a bald spot on the back of the head. Its flesh will become painfully sensitive, so that it will dread to be touched and lifted. It will emaciate generally, but its abdomen will become prominent. If these conditions exist, let the fingers be passed carefully over the back of the head. If irregular holes, with

rather clearly defined edges (as if made with a gouge) are found, the child is rachitic or rickety. Let the fingers be passed carefully down the front of the chest on either side of the breast-bone. If two rows of little bony knobs or "beads" are felt, running up and down the chest, the child is rachitic. Let the wrists and ankles then be examined. If they appear as if a broad ring of bone surrounded the joint immediately above the hand and foot, the child is certainly rachitic, but this should have been found out before.

The existence of the disease being detected, how shall the impending deformity be averted? By supplying in excess those elements of nutrition in which the blood is poor.

The treatment of rickets will therefore be mainly hygienic. Undiluted milk with lime-water, eggs, strong broths, and, as soon as it can be digested, oatmeal, must be given as frequently and in as large quantities as the stomach will tolerate. In addition to this, the salts of lime must be administered medicinally. Of these, none is more readily absorbed into the system than the lacto-phosphate, which may be administered in the form of syrup, or in emulsion with cod-liver oil, or with malt extract.

The child should not be allowed to walk unless in a wheel-crutch, nor should it be permitted to lie long or habitually in one position; that on the face is the best. It should be much in the open air, should be clad in flannel, and should have a daily bath of salt water. Its muscles should be worked and kneaded, and its limbs exercised regularly, twice a day. Mechanical appliances, worn upon the person, are rarely needed or useful, unless in an advanced stage of the disease. Under such a regimen as that just described, very serious distortions will often disappear without mechanical support, the nutrition of the skeleton having been put upon a firm basis.

To sum up:—Rickets is a disease of nutrition in infancy, producing softening, or rather interfering with the natural hardening, of the bones. It results in loss of stature and in deformity of all the parts of the frame. It is characterized by sweating of the scalp, depressions in the back of the skull, openness of the top of the head, late dentition, shortening and curving of the limbs, and enlargement of the joints. It is to be treated by generous diet, hygienic measures, and administration of lime salts.

Dropsy of the Joints.

This disease was spoken of as one result of inflammation. The inflammation, however, may be of so low a grade, as never to

have attracted attention by the usual symptoms of pain, swelling, or heat. A sense of weakness in the part may be the first thing noticed. This will be followed, as the accumulation of fluid in the joint accumulates, by slight stiffness gradually increasing, and by pain on making certain movements. When the swelling becomes very considerable, motion is correspondingly difficult, and when the knee is affected, walking is often impossible.

Symptoms.—The most noticeable feature of this affection is, of course, the swelling. It is distinguished from that of inflammation by the absence of heat, of redness, and of any decided degree of tenderness, and by the absence of feverish symptoms in the patient. The character of the swelling is peculiar. It is soft and elastic. It appears in rounded, bulging prominences on different sides of the joint: and when the fingers of one hand are rested on one of these bulging prominences, and sudden pressure is made upon another, even if on the opposite side of the joint, motion will be directly felt by the former, showing that there is free communication between them, with fluid enough to transmit a wave. This is called a "sense of fluctuation." When the knee is affected, if the knee-cap be tapped smartly with the end of the finger, it will be felt, unless the distention is excessive, to strike against the joint beneath. The swelling shows itself along the sides of the knee-cap, but more along the sides of the strong sinew which attaches the lower edge of the knee-cap to the head of the shinbone, and very noticeably above the joint, often for a considerable distance.

Treatment.—Blisters are positively injurious. Powerful counter-irritants, such as iodine and tartar-emetic not less so. Pressure, either by an elastic knee-cap or a rubber bandage, or by adhesive straps carefully applied, is very useful. Rubbing with oil or unguent, such as cosmoline or vaseline, and massage or kneading, not only of the joint itself, but of the whole limb, are efficacious agents in producing absorption of the fluid. Putting the joint at rest by means of a splint is also often attended by good results. The diet should be generous. Iron and cod-liver oil are often very beneficial, and any drain upon the resources of the system, in the shape of an exhausting discharge, should be sought after and promptly checked. Operative measures should, of course, not be attempted by any but a surgeon.

Hysterical Joints.

Very frequently in women, comparatively rarely in men, certain symptoms of joint disease will manifest themselves, such as

pain, tenderness, stiffness, and difficulty or impossibility of motion, while certain other symptoms which ought to appear if the joints were actually in a state of inflammation or structural change, are entirely absent. Such affections are called *hysterical*—by which it is meant—not that they are not real, as is often supposed, but that the irritation which exists in the joint is confined to the nerves of the joint, not extending to its blood-vessels, and therefore not accompanied by inflammation or any of its destructive results: and further, that this irritation does not necessarily or usually indicate any disease in the nerves of the joint, but a diseased condition of some remote organ, generally connected with the generative function. The nerves of this organ convey an irritation to the nerves on their way to the affected joint, or to the spinal cord at a point where those nerves are given off, and it is then reflected along the latter to the joint. Hence, although disease exists in the system, it does not exist where it appears to be, and where the patient is firmly convinced that it is—in the joint. Formerly, when confinement in bed for long periods, and the excessive use of powerful counter-irritants was the only treatment for joint diseases, to mistake a hysterical joint for a diseased joint was, it can readily be understood, a blunder of the most terrible character. Now, when mechanical extension has so generally taken the place of the severer mode, the error is not so serious in its results, and, indeed, a hysterical joint may often be very successfully treated in this manner. Nevertheless, it is still very important that the distinction should be made, and made early. The following rules are therefore given for the detection of hysterical or simulated disease of the joints:

It is not necessary that the subject of this disease should have been what is ordinarily called hysterical, that is, subject to fits of hysterical laughing and weeping, convulsions, unconsciousness, and so on. And in fact, if previously liable to such attacks, they very often cease when the apparent joint affection commences. The symptoms rather resemble those which exist in acute and severe inflammatory affections. Hence it is from those, and not from the milder and more chronic affections, that we must endeavor to distinguish it. We say, therefore, that the hysteric joint is neither swollen, hot, nor red. All of these conditions may have been produced in it by blisters, poultices, and so on, but they do not *belong* to it, and will quickly disappear if these applications be dispensed with. The patient does not emaciate, grow pale, and lose appetite in the mock disease, nor is there that haggard, anxious expression on the countenance which is so characteristic an index of the suffering arising from inflammation and ulceration of

a joint. Sleep is usually not seriously interfered with, and the starting pains at night are unknown. The pain complained of is inordinately great as compared with the healthy appearance of the joint. The tenderness on pressure is as great or greater when the pressure is slight than when it is severe. And, indeed, the anticipation of being touched seems almost worse than the touch itself.

The joints most liable to become hysterical are the hip and the knee. In the case of the hip, the characteristic pain in the knee will be wanting; there will be no flattening of the buttock, and no filling up of the depression behind the hip-joint. The leg will, if differing in length from its fellow, be shorter, while in the first stage of hip disease, it ought to be longer. Pain and swelling in the groin will be absent. Striking the sole of the foot will not produce pain, as it does in the true disease.

In regard to the knee, the only point to be observed is, that the pain is usually referred to a point just below the knee-cap, which, if seized above, can be moved freely from side to side without causing pain. In the case of the knee especially, etherization will at once remove all stiffness, thus showing the mock character of the disease.

Treatment.—The offending organ must first be sought out and subjected to appropriate treatment if discovered. In the second place, while on the one hand the patient must not be accused of a deception which, in nine cases out of ten, she does not consciously practise, she must be made to understand the true nature of her disease, and her conscience and will must be enlisted on the side of active effort, and resolute endurance of pain. Petting, coddling, and making-much of, must be most carefully avoided. The love of "petting" grows by what it feeds on, and the appetite will soon become so imperative that actual deception will be resorted to in order to secure the longed-for attentions on the part of loved ones. An extension splint serves a good purpose in obstinate cases, in enabling the patient to take exercise, and be out in the fresh air. Change of air, and especially of scene, often works wonders. All direct treatment of the joint, as by leeches, blisters, cauteries, and so on, is injurious to the last degree; but the moral effect of an application of a slightly painful nature at a distance from the joint may be good. On the same principle, the application of galvanism, to such an extent as to produce pain, may be recommended. Cold baths and douches, and all other measures which will invigorate the system, are advisable.

Softening, or Fragility of the Bones

is, like rickets, a disease of nutrition. But unlike that affection, it comes on in advanced life, is accompanied by excessive pain in the limbs, and fever, and is very rapid in its progress, which is usually to a fatal termination. It is characterized by the tendency to frequent fracture of the bones.

The Treatment is the same as that for rickets, but is rarely of any use. Cod-liver oil is here especially indicated.

[House-Maid's Knee.

A disease which may be mistaken for an affection of the knee-*joint*, but which, in reality, is an enlargement of a *bursa* or sac, which is interposed between the knee-cap and the skin which covers it, is the so-called housemaid's knee, shown in the adjoining figure. This is presumed to be caused by the habit of kneeling during the work of scrubbing. The pressure and motion to-and-fro, to which the knee is subjected, causes the sac to enlarge and become filled with fluid.

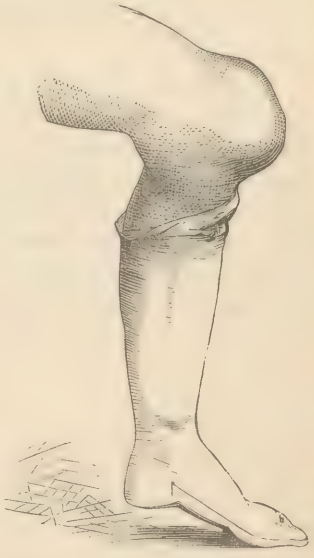

FIGURE 191.—House-maid's knee.

Similar enlargements are found on the elbows of miners who work in a partly reclining posture; on the buttocks (under the ends of the seat-bones or tuberosities of the ischia) in weavers and boatmen, etc. Such enlarged bursæ are liable to become inflamed by injury, and their cavities be filled with matter or pus.

Treatment.—When these swellings first occur, the avoidance of all pressure and the repeated application of very small blisters at different places about the seat of trouble, will often make a cure, but when they are of longer duration, they will require treatment such as only a surgeon can administer. When they become inflamed, as before mentioned, the limb should be kept at rest, and a cloth wet with cold water, or with a solution of a drachm of sugar of lead to the pint of cold water should be applied until the redness and soreness subside; or a decoction of oak-bark (half an ounce to a quart of boiling water, cool

and strain) may be used instead. If matter collects it must be let out.

Ganglion.

This is a name given to enlargements which often occur on the wrist in laboring men, mechanics, oarsmen, gymnasts, and such others as are accustomed to raise heavy weights, or in other ways strain the tendons of the forearm and hand. They may occur wherever a tendon plays through a serous sheath, but the back of the wrist is the most common situation. They are liable to be inflamed by overstraining or injury, and cause excruciating pain. At times they are soft and "boggy" to the touch, and at others are tense and resisting. About the wrist they are liable to spread to the sheaths of several of the tendons going to the hand, where they may largely interfere with its usefulness.

Treatment.—When of recent occurrence, placing the hand on a splint, and keeping it at rest for several days, together with the use of small blisters, as advised in the foregoing section, will be serviceable.

When the ganglion is of the last-mentioned variety, the services of a surgeon are essential. It is sometimes customary, when the swelling is small, to attempt the rupture of the sac by striking it with the back of a book or something similar, or by pressure with the thumbs, and afterward, by keeping the hand at rest, and applying pressure with a pad and bandage, to prevent it from refilling with fluid. This is not, however, free from danger, and should be left to a surgeon.—Ed.]

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General Surgery.

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GENERAL SURGERY.

TUMORS.

Tumor, in the strictest signification of the term, is a mere swelling (*tumere*, to swell), but in a surgical sense is understood to be a more or less circumscribed prominence in any part of the body, non-inflammatory in character, and due to an unnatural growth of tissue. In the popular mind the word tumor is associated with a condition of things desperate in the extreme, if not past help. The reason for this is probably in part due to the fact that these growths are generally supposed to be of a cancerous character, and are, therefore, necessarily fatal in their tendencies. Again, their importance is greatly magnified because some cutting operation is usually required in their treatment. In truth, however, very many tumors are entirely innocent in character, and occasion no inconvenience to the patient except those which are purely mechanical in character. For instance, a growth may be so situated as to create great deformity; may be of such size as to be an actual burden, or it may, directly or indirectly, embarrass the action of an organ. Otherwise these tumors do no harm, grow very slowly, and may be carried for a long lifetime without material injury to the health. On this account the adjective *benign* is chosen to designate this class of growth. The simple, innocent, or benign tumors are composed of fat, bone, and cartilage; fibrinous, mucous and vascular tissues, and may occupy any part of the body. They increase in size independently of the surrounding tissues, from which they are usually separated by a dense wall of membrane, called a cyst. The composition of these growths is simple and uniform for each variety, being entirely of fat in one case, entirely of fibrous tissue in another, and so on. The only manner in which the surrounding organs suffer is by displacement, or pressure, or both. The overlying skin is, as a rule, healthy, non-adherent, and supple.

Fatty Tumors.

The fatty tumor is not only the most common variety, but may be taken as the type of the innocent, or benign growths. It is usually situated upon the trunk, or the extremities near the trunk, although it is met with in any other situations which are supplied with fatty or adipose tissue. Although growing very slowly, it sometimes attains an enormous size. In one instance on record, such a tumor weighed nearly seventy pounds.

Not unfrequently it becomes pendulous, or hanging in character, and when of considerable size, and attached, as it sometimes is, to the root of the neck, gives the patient the appearance of the extra flesh being an actual burden. Sometimes these hanging tumors have their attachments to the extremities, and give rise to much inconvenience in impeding free and necessary movements.

FIGURE 192.—Fatty tumor of elbow.

The fatty tumor may be said to be a mere circumscribed increase of the fatty tissue of a given locality. This departure from the natural appearance of a part is sometimes so slight as scarcely to be noticed, appearing as a mere increase of plumpness. The large double chin is an instance of this condition. As soon, however, as the enlargement has a shape of its own, distinct from the surrounding tissue, it presents the characters of a tumor. As might be expected from its composition, this growth has a semi-elastic doughy feel. Sometimes the surface is lobulated or lumpy, but generally it is smooth, the skin covering it being healthy and freely movable. The attachments, as a rule, are neither very firm nor very deep. The tumor itself is, save in exceptional cases, enveloped in a sac.

Fibrous Tumors.

The fibrous tumor resembles, in general character, the fatty tumor, except that it is harder and firmer to the feel, is more firmly attached, and is even slower in its growth. Its favorite seat

is the uterus, but it is also commonly found on the skin, nerves, bones, throat, lobe of the ear, and lower bowel. Generally, it is

FIGURE 193.—Hanging fibrous tumor of leg.

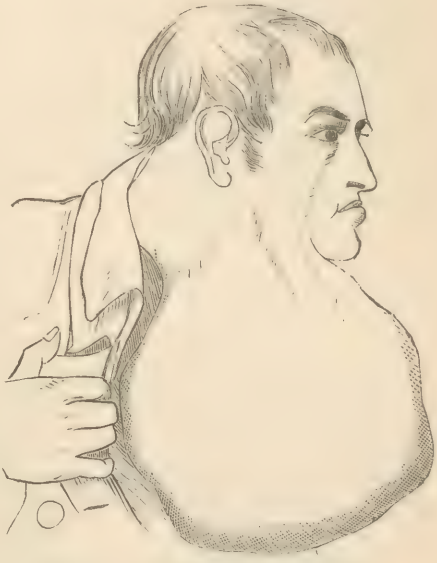

FIGURE 194.—Fibrous tumor of neck.

FIGURE 195.—Fibrous tumor of ear.

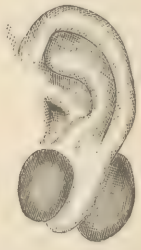

FIGURE 196.—Fibrous tumor of ear.

surrounded by a cell-wall. Sometimes these growths contain closed sacs of fluid, giving rise to irregularities upon the sur-

face, and to differences in the feel when compared with the more solid parts. Like the fatty tumor it occasions inconvenience, principally in a mechanical way. A type of this tumor is often seen connected with the lobe or tip of the ear, and appears to be caused by the irritation of earrings. These growths are apt to be of irregular shape, to attain a considerable size, and occasion great deformity. For some unexplained reason, such varieties of this tumor are most frequently seen in mulatto females.

The fibrous tumors, as a class, are more apt to be hanging than the fatty, and are chiefly distinguished from the latter by their hard and firm feel.

Vascular Tumors.

The tumors formed by vascular tissue are those known as bloody tumors, and in a less degree as "mother's marks." They are most frequently situated about the face, occasion great deformity, and appear with birth. Their substance is spongy in character, and is composed of blood-vessels of greater or less size. Generally, the skin covering them is of a purplish or bluish color, and contains numerous small branching vessels highly injected. Pressure upon such tumors will partly or wholly empty them of the blood. When pressure is renewed they will quickly refill. The summits, and often the surroundings, of these tumors are covered with hair, in which case the overlying skin is of a brownish color.

FIGURE 197.—Vascular or bloody tumor of face.

The ordinary "*port-wine mark*" is a mere irregular purple blotch, but there is, in reality, a difference only in the degree of growth as compared with the vascular tumor itself.

The supposed causes for these defects are maternal impressions before the birth of the child. Some very curious stories are told of the relations between the so-called cause and effect in these cases, but in the present state of science they can be considered little else than striking coincidences.

The treatment of these tumors is peculiar as compared with others. We refer to it now, in passing. It consists in killing the substance of the growth by means of a red-hot needle thrust in

different directions from its circumference to its centre. But such a proceeding, for very obvious reasons, is not to be entrusted to a novice. Sometimes galvanism is used for the same purpose.

Horny Tumors.

Horny tumors are of very unfrequent occurrence. They spring from the skin, are of very slow growth, and are easily removed by operation. Their frequent location is upon the head, although they have been seen upon the tip of the nose and chin. The growths are always of an innocent character, and are, consequently, not apt to return after removal.

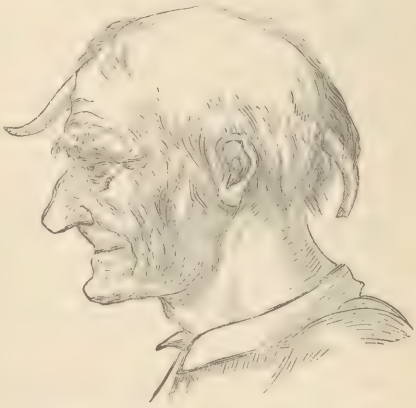

FIGURE 198.—Horny tumors of head.

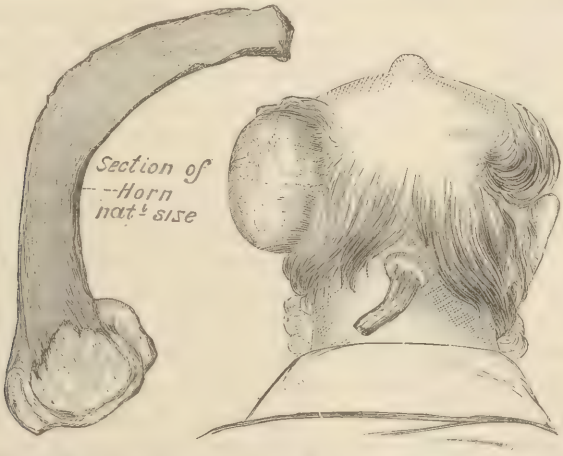

FIGURE 199.—Horny tumor of head, with accompanying "wens."

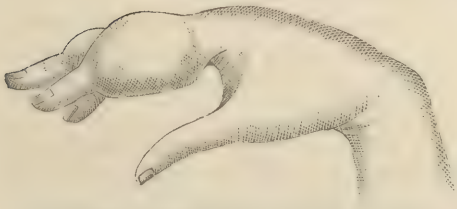

FIGURE 200.—Cartilaginous tumors of fingers.

Cartilaginous Tumors.

The cartilaginous tumors may occur singly or in groups. They are seen most frequently connected with the joints of the fingers or toes, are very hard, slightly elastic, and never of themselves give rise to pain. They are quite apt, especially if much irritated, to degenerate into malignant tumors, when they grow with considerable rapidity.

Bony Tumors.

Bony tumors—or, to use the term in a wider sense, tumors connected with bone—may occur during almost any period of life. They may be composed entirely of bone and cartilage, or of bone and more or less dense fibrous tissue.

The pure bony tumor is a simple localized increase of the bone affected, and varies greatly in shape. Under some circumstances it is an ill-defined and flattened swelling, extending over a comparatively large surface. Occasionally it is distinctly globular, and very rarely its base is narrower than the growth itself. When composed of pure bone it sometimes becomes of ivory hardness. As a rule, it is of slow growth and seldom attains a large size.

Fibrous tumors of bone constitute a distinct variety of growths. As they take all their peculiarities from the situation in which they are developed, they are considered under the present division rather than under that of simple fibrous growths. Although in other parts of the body fibrous tumors, so called, as a rule are simple in character and not liable to return, when connected with the bone that are almost always open to the suspicion of malignancy. Especially is this true of a variety of fibrous tumor of uneven consistency and of rapid growth. This is called *sarcoma*. It springs from the membrane covering the bone, and is liable to involve the neighboring soft parts. Such growths are almost always sure to return and to act in many respects like true cancer. That is to say, even when the disease is removed it may return in the same locality, or, if not, make its appearance in some of the internal organs, such as the lungs, liver, or kidney.

This variety of fibrous tumor of the bone which, unfortunately, is more common than the simple form, is usually circumscribed, and not infrequently follows an injury to the bone or bone-membrane from which it springs. Its most common seat is at or near the end of one of the long bones, and its outline is more or less regular. On handling, it gives the impression of being somewhat softer in some places than in others. This condition is explained by the fact that a cartilaginous or bony tissue is found mixed with the growth, or the fibrous tissue itself is of different density and firmness.

The bases of these tumors are always firmly attached to the bone, while the tumors themselves, during their growth, push the overlying muscles and other soft tissues before them. The growth of these tumors is usually quite slow, and is not attended with much pain. Adult age is the time of life during which they occur most frequently.

When the existence of this disease is certain, amputation of the

affected limb at the farthest possible point from the disease is the only safe procedure ; otherwise the growth, through the medium of the blood-vessels, is apt to propagate itself to the internal organs. When so situated as to forbid amputation, thorough extirpation is usually advisable. In either event, it is necessary to exercise the greatest possible precautions against the return of the disease. The degree of malignancy of this form of tumor of bone can be measured by the rapidity of its growth, the comparative softness and irregular consistency of its texture, and the degree of constitutional disturbance which it occasions.

A bony tumor may be cancerous in character, and may give rise to many of the symptoms named. Generally bone cancer is more rapid in its course, is liable to involve the skin, and may cause fracture. As regards the necessity for prompt and radical treatment, there is no practical difference between the two forms of disease.

Cystic Tumors.

Very often, outgrowths in the shape of tumors consist of little more than closed sacs, containing a fluid or semi-solid material. This variety is called *cystic*. The feel is semi-elastic, but, contrary to that of the fatty tumor, gives an idea of a fluid or semi-fluid contents. The tumor connected with the ovary is an example of the class, as well as similar outgrowths which are connected with the under-surface of the tongue, the anterior portion of the throat, and over the knee-pan.

FIGURE 201.—Cystic tumor of scalp.

The most common variety of the semi-solid cyst is that seen on the scalp, which contains a cheesy-like, fatty material, and which is popularly known as a "wen." These "wens" vary in size, are apt to occur in groups, and sometimes occasion much annoying interference with the proper combing and brushing of the hair. Unless of unusual dimensions these growths can be very effectually hidden by the hair. They are apt, as the result of injury, to inflame and ulcerate, giving vent to an offensive discharge. Sometimes the tumor disappears in this way.

The benign or innocent tumors only become the subjects of special treatment, when, by their position, great deformity re-

sults, or, by their pressure upon adjacent organs, an interference of function is produced. As all local applications are useless, and as internal medication is of no avail, the treatment is narrowed down to removal of the growths by surgical operation.

It may be well to state here that many of these tumors are christened "cancerous" by the quacks, and are treated by them accordingly. Consequently, what at first was an innocent growth, becomes converted, by the use of caustics, into a ragged and formidable-looking sore. When this sore heals, as it will when no more irritating applications are made, the so-called cancer is said to have been cured. With the great majority of even intelligent people, it has never occurred to them to ask the question whether or no their disease was really a cancer, or some one of the many varieties of innocent tumors. As no patient, however learned in other things, is able to come to a definite conclusion regarding the nature of any tumor, and, as it is not likely that the quack, with his patent salve or never-failing caustic, will give impartial advice, it is always safe and proper first to obtain the opinion of the family physician. He will be competent to state the true nature of the growth and advise as to the proper treatment in each individual case. In regard to this method of so-called cure of cancer by caustics, more will be said under the head of the treatment of that disease.

Cancer.

Distinguished from the simple, innocent, or benign tumors, are those which are called malignant. Benign tumors are circumscribed, are not liable to spread, are covered by healthy skin; do not involve neighboring organs, do not compromise the life of the patient, and are not inclined to return after removal. On the contrary, malignant tumors always, sooner or later, invade the skin and neighboring tissues, have no tendency to limitation, involve other parts of the body by means of absorption of the tumor elements, if left to themselves invariably kill the patient, and are always liable to return after removal.

Although there are several distinct varieties of growths which are said by surgeons to be malignant, practically speaking the description of such varieties can be most intelligently made from a popular standpoint under the general heading of Cancer.

Cancer is, as a rule, a condition of tumor, but generally it is a term which can be applied to mere malignant ulcerations. The word cancer, signifying a crab, was given to this disease by the ancients, although it is difficult to see for what reason. Sometimes the form of ulceration can, by an active imagination, be

made to resemble that of the crab, so also can the twisted condition of the large veins in the neighborhood of the tumor.

Cancer may occur in any part of the body, but its most frequent seat is the female breast. The period of life most liable to the invasion of the disease is between thirty-two and forty-five. Its occurrence is not, however, impossible in the infant at birth, or in the patient of "three-score years and ten."

Let us, for the sake of describing the general character of can-

FIGURE 202.—Ulcerated or rose cancer of breast.

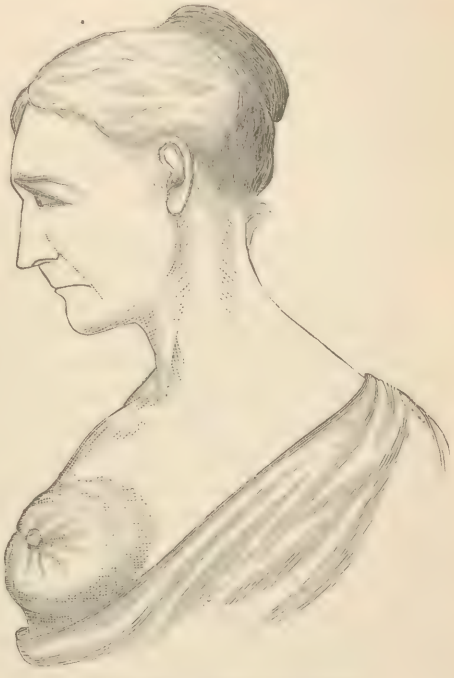

FIGURE 203.—Cancer of breast.

cer, give its history as occurring in its favorite locality already named.

Its first appearance is usually as a small, hard lump under the skin and near the nipple. It is attached, by its base, to the substance of the breast itself. So seldom is pain present at this time that the growth is most frequently discovered by accident. As the tumor—for, small as it is, it is nothing more nor less—increases in size, pain of a peculiar darting character manifests itself, and generally radiates from the disease toward the armpit. Enlarging still more, the mass involves the surrounding tissues, infiltrating them with the cancerous material, and creating an irregular belt of hardness. This hardening is an evidence of the matting of the tissues in a

common disease, and extends until the breast becomes firmly adherent to the chest-wall, and of almost stony hardness. While this is going on, the diseased material is carried by the absorbent vessels to the armpit, and, as a result, new cancerous tumors form in that locality. In the same manner, similar growths appear at the root of the neck. About this time the general health begins to suffer, the patient presenting a peculiar sallow complexion and careworn look. Also, sooner or later, small hard bodies appear underneath the skin, over the tumor, enlarge and run together. The skin itself, in its turn, becomes brawny, gives way, and an irregular ulcer with raised and turned out edges, of greater or less size, is the result. This ulcer never heals, but, on the contrary, enlarges, and is the source of a protracted, exhausting, and foul-smelling discharge. It is this condition of ulceration which is indicated by the popular term "rose cancer." The patient may be worn out by this extra drain upon the system, fatal bleeding may occur by the ulceration opening a blood-vessel, or life may be terminated by the secondary invasion of some internal organ, such as the liver, lung, kidney, or uterus.

Notwithstanding the frequency of cancerous tumors of the breast, it does not by any means follow that all growths in that locality are necessarily of that character. A great number of tumors of the breast are entirely innocent. An injury of the organ is suffered, some pain is occasioned, and then a localized swelling may appear. This may be nothing more than a hardening of a portion of the substance of the breast, a swelling which will disappear of itself if let alone. Or, it may be a temporary enlargement of a portion of the gland which may remain an indifferent period without causing any trouble. Such cases, if submitted to the active treatment of stimulating plasters, irritating liniments, or caustics, are apt, in the end, to become actually cancerous, especially if there be present in the individual any hereditary tendency to the disease. But in regard to the matter of mistakes regarding the presence of cancer, what may appear stranger than all is, that cases are not unfrequently seen in which the lobulated, knotty feel of the perfectly healthy breast, is supposed, by the patient, to be due to a malignant tumor. These cases tend to show, as do all cases of tumor, actual or supposed, that it is always safer to trust to the opinion of an educated physician.

The general history of cancer in the breast is similar to that of the disease in other parts of the body. As in that organ, cancer commences by forming a firm attachment for its base, and this attached base widens as the disease progresses. Figuratively speaking, its growth may be likened to that of a tree—the larger

the top the deeper do the roots penetrate. Other characteristics of malignancy in a tumor are an extension of disease to the overlying skin, of the neighboring glands, and the disposition to ulcerate. Taken separately, these symptoms are suspicious; grouped together and properly weighed they are almost, if not quite, conclusive. It must be confessed, however, that there is oftentimes a doubt among the most experienced surgeons concerning the existence of cancer in a given case. Under such circumstances, however, a microscopical examination of the tumor settles the question as to its precise character.

The most common variety of the disease is that known as *scirrhus*, or "*hard cancer*," popularly called "*stone cancer*" and "*crab cancer*." "*Rose cancer*" is nothing more than the ulcerating process of any of the varieties. But the growth is sometimes so soft in consistency as to merit the name of soft or *medullary cancer*. Not infrequently this variety is stained by a black pigment, and is usually spoken of as "*black cancer*." The most frequent seat of the latter is in the eye. A third form is the so-called "*skin cancer*," or *epithelioma*. Each of these has a history which varies with the part of the body affected, and with the character of the growth itself. In some localities the pain occasioned by the disease is greater than in others, and the disturbance of the function is more marked in one organ than in another. The soft cancers grow more rapidly than the hard, and the hard more rapidly than the skin cancers. The rapidity of the growth is also governed by the degree of moisture in the locality affected, or by the degree of the activity of the organ invaded. Thus, the disease is more active when it attacks the tongue, the lower bowel, the bladder, and the uterus, than when it invades the bone or the skin. As before stated, cancer may occur in any part of the body, but it is only necessary to refer to it in those localities which are accessible to the surgeon.

When the disease occurs in the eye, as already remarked, it commonly takes on the black form. Sometimes it appears in the substance of the eye, making its way externally, sometimes in the socket of the eye, and at other times on the surface of the eyeball itself. Generally, the eyesight is affected early, deep-seated pain is quite constant from the beginning, and not infrequently the eye protrudes, sometimes to such an extent as scarcely to be covered by the lids. When ulceration occurs, the granulations are, of course, blackened, and in some cases give the appearance of having been sprinkled with charcoal or stained with writing-ink.

Cancer of the tongue first shows itself as a hard, angry ulceration on the side or tip of the organ, and is quite painful when

touched by articles of food, or by the teeth. Sometimes the act of swallowing is intolerable. The patient generally supposes that the ulcer was caused by the irritation of an adjoining decayed tooth. As the disease progresses, the floor of the mouth becomes involved, also the glands under the lower jaw, and in some cases it extends into the throat. Pain in the ear is quite a common symptom.

FIGURE 204.—Cancer of the tongue.

Cancer of the lower lip belongs to the skin variety of the disease. This occurs at first as a circumscribed hardness of the margin of the lower lip, becomes ulcerated, presenting a more or less gouged appearance upon its surface, with hardened edges, and may destroy the whole substance of the lip, and in fact, the greater part of the face itself. The upper lip is very rarely involved, save by extension of the disease from the lower lip.

Causes.—The precise cause of cancer is not known. There is a general belief that the disease is a constitutional one, and that certain individuals have a hereditary predisposition to it. On the contrary, a large number of cases have no hereditary history whatever, the disease appearing to commence as a local one in a perfectly independent way. Some surgeons are inclined to believe that in the majority of cases the disease has a purely local origin, due to some persistent irritation of the part. Certain it is, that constant irritation is very often followed by cancerous disease of that part. For instance, the prevalence of cancer of the lip among smokers of clay pipes, is well proven; the irritation of a decayed tooth is so often present in cancer of the tongue, that there seems to be a relation which is similar to that between cause and effect. It is fair to suppose that there must be some predisposition in the system to cancer, in those individuals affected, and that irritation possibly determines the deposit of the diseased matter in a particular organ. Bearing upon the latter supposition is the fact that irritation of a cancer causes it to grow with great rapidity, when before it was in a comparatively quiescent state.

Treatment.—Cancer is a disease which is very naturally looked upon with dread by every one. Its malignant tendency, the suffering which it occasions, the acknowledged difficulties in the way of arresting its progress, make the chances for life desperate even to the most hopeful. Hence it is that the quack, always ready to

take advantage of such a state of things, has more so-called remedies for this disease than for any other.

It is safe to say that no medicine has yet been found which will cure cancer. This is a fact which it is well to take into account in connection with the boasted efficacy of the patent elixirs, of the secret powders, and of the miraculous pills so extensively advertised as cancer-cures. No wash or liniment is sufficiently powerful to cause a malignant tumor to disappear, and no salve has been discovered which can heal over an ulcerated surface caused by the disease. All the hopes for relief are centred in the removal of the growth. The sooner this is done the better. In the earlier periods of invasion the disease is localized within a small compass, and can easily be removed without the sacrifice of much of the adjoining healthy tissue.

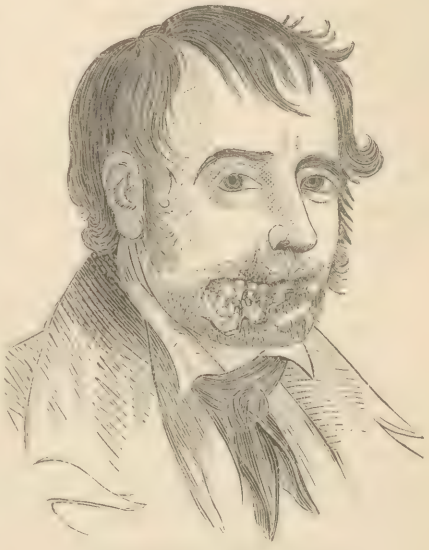

FIGURE 205.—Cancer of lip.

The best way to do this is by means of an operation with the knife, the patient having been previously made insensible by chloroform or ether. This is a general principle of treatment which, however, can only be made to apply to a particular case by the opinion of the physician in charge. The responsibility of deciding belongs entirely with him, or with those whom he may call in consultation, and should not be assumed by the patient. There are many circumstances that may militate against an operation, and which can never be appreciated by any save a medical man. These are, for instance, the extent of the disease, the constitution of the patient, his age and surroundings, the rapidity of the growth, and the locality of the body affected. There is such a general repugnance to a surgical operation that few, if any, submit to it willingly. To the ordinary popular mind there is an aversion to being made insensible, and in being cut while in such a state. Then, again, the idea that a large quantity of blood may be lost, and also the fear that the patient may, perhaps, never survive the shock of the operation, are too prevalent to require reference.

In most cases, the operations are not of a formidable character,

very little blood is lost, and the patient suffers no pain. The resulting wound is a clean and healthy one, and is usually rapidly healed.

The popular prejudice, however, is in favor of burning out the cancers with caustics. This is a method which is always second best, and is applicable only to such cases of superficial cancers as are spread over large surfaces, and the removal of which, by the knife, is inadvisable. By this means the least amount of surrounding healthy tissue is removed, but this is by no means an advantage, considering the necessity of working as wide of the mark of the disease as possible. No suspicious tissue should ever be left after an operation for cancer, whether that operation be performed by the knife, the hot iron, or caustic. Hence it follows that no operation should be undertaken unless such a result can be guaranteed. Otherwise, the disease is not only sure to return, but reappears with great rapidity and increased malignancy.

Various methods are resorted to for burning out cancers. A popular one with the quacks and so-called cancer-curers, is the employment of a caustic paste, the essential ingredient of which is arsenic. Occasionally chloride of zinc, chloride of ammonium, and similar caustics are employed, mixed with poke-root or some other vegetable. The paste is smeared over the tumor or the ulceration, and is allowed to remain there until the underlying tissue is killed. The application causes great pain, but this is said to be merely the preliminary treatment. When a slough or dead tissue is produced, there is then, of course, no pain, and the so-called "cancer" is apparently removed from the bed of the wound, root and branch. The appearance of the "roots" of the disease is simply due to the irregular action of the caustic in different parts. In some places it penetrates deeper than others, and a string of dead tissue is the result. The same thing occurs when caustics are applied to perfectly healthy tissues. This is, perhaps, the reason why so many persons suppose they have been cured of cancer by cancer doctors, when, in reality, they have only had simple ulcers, or some one of the varieties of innocent tumors.

As these caustics have no power of searching out cancerous material and leaving sound tissue, it naturally follows, especially in the case of deep-seated tumors, that some of the disease may still be left, in which case, for reasons already stated, the patient is in a worse condition than before the operation.

When the caustic is thoroughly applied to a superficial cancerous ulceration by an intelligent practitioner, the disease may be eradicated, but such a result can never be guaranteed when the paste is used on a tumor of any ordinary size. The caustic can

only burn to a certain depth, and after the separation of the slough a foul cancerous ulcer is apt to be left, and the disease stimulated to an increased activity, which is oftentimes terrible to contemplate. Numerous cases of this sort frequently find their way into the hospitals, when their chances for help are gone, and long after their cures have been advertised in the newspapers. Aside from the want of reliability of the caustic treatment, and the tendency of increasing the activity of the disease, there are positive dangers in the shape of arsenical poisoning from the paste used, and from the occasional alarming bleeding when the dead tissue is ready to separate.

Although it is impossible for those not educated as physicians to treat successfully the various kinds of tumors by removing them, they can do something toward alleviating symptoms and meeting certain emergencies. It should be borne in mind that an inflammation of any growth is always to be avoided. Hence, any tumor should be guarded against injury as much as possible. When, however, inflammation does occur, everything should be done to reduce it as soon as possible. Cooling applications should be made by cloths dipped in cold water, or by an evaporating lotion made of one part alcohol and six or eight parts of water.

The discharge which takes place when the cancer passes into the stage of ulceration, is oftentimes so foul-smelling as to be intolerable to the patient and to others in the house. In such cases everything should be done to correct the odor. In the first place the parts should be kept clean, and the dressings should be changed frequently. A very good disinfecting wash is made by adding one part of carbolic acid to forty parts of water. This lotion may be kept constantly applied to the ulcerating surface. To some patients the smell of carbolic acid is quite disagreeable, and is not used on that account. This is an unfortunate circumstance, as no other disinfectant is superior to it.

The next choice of a deodorizer is the solution of the permanganate of potash in the proportion of four to eight grains to the ounce of water.

A very good application for the same purpose is that of simple dry or baked clay, finely powdered, and dusted over the part. The earth adheres to the moist surface, absorbs the discharges, protects the ulcer, and does not produce irritation. As soon as any part of the application becomes saturated, it may be allowed to fall off or be gently removed, and fresh earth dusted on as before.

In the progress of ulceration a blood-vessel of some size may be opened. According to the extent of the opening and the size of the vessel, the bleeding may be more or less alarming. Ordinary

oozing of blood may be stopped by the application of small pieces of ice to the bleeding part. When the flow is more considerable, pressure with the finger, or with a pad of muslin secured by a bandage will arrest it. If, despite this, the blood soaks through the bandages, the compress should be reapplied with more firmness, and this failing, pressure should be made upon the main artery between the bleeding point and the heart. Such cases, though happily of rare occurrence, require the immediate attendance of a medical man.

Aneurism or Ruptured Blood-Vessel.

Aneurism or "ruptured blood-vessel," as it is popularly termed, is, in a general sense, a pulsating or beating swelling or tumor containing blood and connected with an artery. It is situated in the course of the large blood-vessels either inside or outside the body. The condition of aneurism may be defined as an expansion of one or more coats of the vessel. In order to understand how this may occur it is necessary to recollect that there are three coats to an artery—the inner, middle, and outer coats. All of these coats may expand together, forming a uniform enlargement of the vessel, but more frequently the inner and middle coats are torn and the outer coat only is expanded. This enlargement of the artery is generally limited in extent, and is occasioned by the pressure of the blood-current. Sometimes the three coats of the artery are ruptured at one time. In that case the blood escapes directly into the surrounding tissues. Nature limits the escape of the blood by forming a clot on the margin of the effusion, which clot helps to make a firm wall or sac for the swelling. Although the latter is outside of the artery, it generally maintains its connection with that vessel through the original rupture, and is, to all intents and purposes, just as much an aneurism as any of the other varieties.

FIGURE 206.—Aneurism of artery (sub-clavian) at root of the neck.

Aneurism generally occurs during and after middle life, for the reason that the inner coats of the arteries are then more brittle, and, consequently, more liable to rupture than during youth.

The exciting cause of the trouble is usually an extra and sudden strain of one or more parts of the body. Not only is the blood-pressure increased thereby, but the artery itself may be torn by direct or indirect violence. For instance, aneurism has been

known to occur as the result of lifting unusually heavy weights, of running rapidly, of jumping, and unduly testing the strength. When the arteries are elastic and can sustain extra strain, as during early life, there is not so much danger, but the contrary is always the rule with persons advanced in years.

The ways in which the artery may be torn or injured by direct violence are numerous. It is true the main vessels are situated in those parts of the body least exposed to external injury, but they are not always out of harm's way. Nature has guarded against any stretching of an artery during forced straightening of the limbs by limiting such action of the limbs and by placing the vessels on the bending sides and as far as possible from exposed situations. Thus we notice that the main arteries of the arms are tucked away under the arm-pit and on the inner part of the arm, and the same is true of the thigh. The arteries of the forearm and leg are covered by thick muscles, except at the wrist and ankle where they are necessarily near the surface. The main vessels of the neck are also in the line of flexion, and are protected by the chin, angle of the jaw, large muscles of the neck, collar- and breast-bones. As examples of direct injury or violence producing aneurism, we may mention the following cases: One man suffered from aneurism of the groin by falling backward while rowing in a boat, the sudden stretch upon the artery causing its rupture; another man brought about the same condition by stumbling forward while carrying a large and heavy kettle; another caused an aneurism between his hamstrings, back of his knee, by violently kicking a door; another by jumping on a spring-board in a gymnasium, and another by being thrown by a horse. Not infrequently the vessel is wounded by some sharp instrument or by a bullet. Under such circumstances, of course all the coats of the artery are involved in the injury. To illustrate how easily the accident may occur it is necessary only to refer to the case of a boy who accidentally dropped an ordinary jack-knife in his lap. The point happened to strike the main artery on the inner side of the thigh, an aneurism was the result, and the patient came very near losing his leg. Blood-vessels are often wounded by pistol-balls, but in general results such injuries do not differ from those already mentioned.

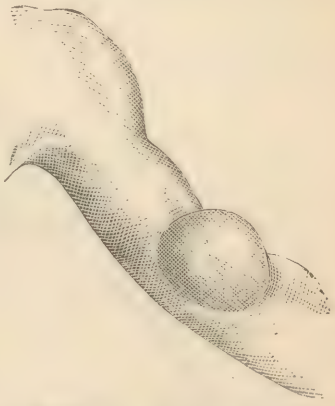

FIGURE 207.—Aneurism of artery (brachial) at bend of elbow.

When an aneurism is formed from any cause, and when situated on the external part of the body, the attention of the patient is first directed to a limited swelling, which is of pulsating or beating character. The beatings correspond with those of the heart and with the pulse at the wrist, and being due to the blood-current are constant in character. Sometimes the patient suffers from great pain on account of the pressure of the swelling upon some of the more important nerves in the neighborhood.

The sudden appearance of an aneurism is generally marked by a sensation as if something had snapped or broken, and is usually likened to that of a smart blow on the part. When the condition can be recognized early it is well for the patient to maintain the most absolute quiet, to avoid handling the swelling, and to control the force of the blood-current by pressing upon the main artery between the tumor and the heart. Cooling applications are generally grateful, as is also an elevated and bent position of the limb. The latter places the limb in the most favorable position for the formation of a clot in the sac.

FIGURE 208.—Aneurism of main artery (femoral) of thigh.

The general principle of treatment of aneurism is centred in the obliteration of the sac by the formation of a clot in its interior and the diversion of the main blood-current into a different channel.

Various means are used to bring about these results, such, for instance, as forced bending of the limb, keeping it in such position for a long period, and by the finger or some mechanical apparatus upon the artery supplying the aneurism, but the most trustworthy is the arrest of the blood-current, by tying the supplying artery. In this way the inner coats of the vessel are torn across and retract, a clot plugs the vessel on both sides of the ligature or string, the contents of the sac also become solidified, and the current of blood takes a new course determined by such branches above and below the point of stoppage as communicate with each other. The branches thus changing the course of the blood-flow become enlarged and virtually form a new main artery.

The operation of tying the artery is one which varies in risk according to the vessel involved, but is ordinarily a safe procedure.

It should not, of course, be attempted by any save an experienced medical attendant. Fortunately the necessity for prompt treatment is not, as a rule, very urgent, and the patient can have plenty of time in which to obtain the required assistance. Although aneurisms may be carried for indefinite periods, the patient is never secure against accident; and, all other things being equal, the sooner he submits to treatment the better. The swelling often being of the same size for a long period, may become enlarged suddenly, endangering neighboring parts by direct pressure; or ulceration of the sac may occur, or the tumor may burst in either of the latter cases and sudden death may result from profuse bleeding. It must be borne in mind that the growth is more or less liable to direct injury according to its position. Nature, however, does her best to guard against the accidents of rupture and enlargement of the aneurism by depositing on the inside and outside of the sac layers of fibrine, which thicken and strengthen the original walls.

If by any accident the aneurism should become ruptured, or should suffer such injury as would cause bleeding, firm pressure should be promptly made above the swelling, upon the supplying artery, until help arrives. This can best be done in the case of a limb by tying a handkerchief tightly around it and twisting it by means of a stick, as shown in another part of this work.

Hare-Lip or Split-Lip.

Hare-lip is a deformity in the human being resembling the natural condition in the hare and rabbit. For this reason it receives its particular name. It is due to an arrest of the natural development of the upper lip before the child is born. The bony and soft parts of the upper jaw are originally formed of two halves joined together in the middle line of the roof of the mouth. In the front part of the upper jaw, under the nose, there is a deficiency which is filled up with a triangular wedge-shaped bone also divided in the middle line. The soft parts correspond in their mode of development with the bony formations to which they are attached. Thus there is originally a separate and central portion of lip which belongs to the wedge-shaped bone, and like it, is separated from the portions of the upper lip at either side.

When the upper portions of the face are naturally developed all the different parts are joined together, making the central and two side portions of the jaw one piece, as also the central and side portions of the upper lip. If, however, the growth is arrested at

any period, any one or more of these portions may fail to unite and a deficiency will be left. In the case of hare-lip, when the wedge-shaped bone unites only on one side, there is a split of the lip on the other side; and when neither side of the central lip becomes attached there is, of course, a double split. Very often these conditions of the lips are associated with those of the upper jaw, and there is not only a deficiency of the upper lip on both sides, but the splits may extend on one or both sides of the wedge bone entirely through the hard and soft palate. When the wedge-shaped bone is not united with its corresponding sides of the jaw, it is apt to project forward at the upper portion of the cleft and give the little patient the appearance of having a double nose.

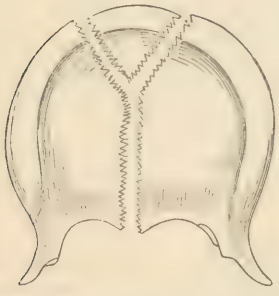

FIG. 209.—Roof of mouth of infant, showing the formation of the upper jaw.

The deformity, even in cases of simple hare-lip—those in which there is a single split—is always considerable. It varies in degree according to the amount of deficiency present. When the split is very wide or double, or extends through the upper jaw, the corresponding nostril is flattened, the point of the nose is drawn down, the child presents a hideous expression, and even its mother turns from it in disgust. When the deformity is associated with cleft palate, the cavity of the nose is exposed and food very often overflows through the nostrils. So marked is this latter trouble that it is often very difficult to feed such children properly. It is, of course, unnecessary to say that in the majority of such instances suckling is out of the question.

The most complicated cases of hare-lip are those in which there is a projecting wedge-shaped bone with the accompanying condition of split-palate. The deformity in such is very great, and transforms what otherwise might have been a beautiful, lovable child into a repulsive monster. Not infrequently some rudimentary teeth are found growing from the central projection and increase, not a little, the general hideous effect.

It is very commonly believed that this deformity is the result of fright or other impression of the mother previous to the birth of the child. But, as has been said on a previous occasion in regard to another congenital deformity, there is no relation between the supposed cause and effect. In fact, if fright of the mother has anything directly to do with this and other deformities said to depend upon like causes, a well-formed child would be exceedingly

rare. That it is the exception, however, to have anything but perfect babies, every loving mother knows. Then, again, this deformity sometimes descends from one generation to another in a particular family. One case has been related in which hare-lip was thus hereditary for over one hundred years, scarcely a male

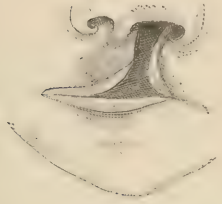

FIGURE 210.

FIGURE 211.

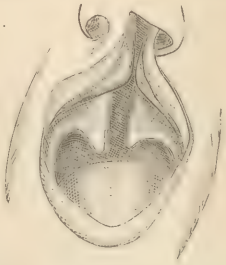

FIGURE 212.

member escaping. It is not a very uncommon circumstance to see two or more members of a family similarly deformed with one or other of the varieties of the split-lip. Generally about one in ten of all children affected have the complicated variety of hare-lip. It occurs most frequently in males, and upon the left side of the upper lip.

FIGURE 213.

There is no treatment for this deformity save that by a surgical operation. The latter consists in paring the edges of the cleft on one or both sides and accurately bringing them together by means of pins and stitches. When the central wedge of bone projects, it may either be removed or pressed backward into the opening. Any unevenness of the arching gums is corrected by pressing the bulging portion into line. Under ordinary circumstances, and when everything progresses favorably, the wounds usually heal within a week. The operation is not attended with any special danger, and the patient, being under the influence of chloroform, need not suffer any pain.

The time for operating may vary according to the urgency of the case. Under some circumstances it may be necessary to operate as early as the fourth or fifth week. Usually surgeons when they can make a choice prefer any period from the third month to that of commencing dentition. The results of treatment are, as a rule, extremely gratifying. In the majority of cases the cleft is perfectly closed and the attending deformity entirely removed. The flattening and expansion of the nose are corrected

and the whole configuration of the face is entirely changed. The child is given perfect command over its lip, and can use it with ease in the performance of all its complicated functions; in fact, may be transformed from a pitiable, hideous monster to a lovely child, with expressive mouth and intelligent countenance.

Cleft Palate.

Although split-palate may be associated with hare-lip, it is often an independent condition. Like hare-lip, it is due to lack of proper development of the part, or rather to the want of union between the two halves of the upper jaw. The cleft may be limited to the hanging teat of the soft palate, may extend through the middle line of the palate curtain as far as the bony roof of the mouth, or may involve the whole of the latter, causing a direct communication between the nose and mouth. In cases in which the cleft is complete there is little or no roof for the mouth, and the cavities of the nose can be plainly seen from below, presenting a large, irregular opening lined with mucous membrane.

Cleft palate by itself—that is, not associated with hare-lip, is

FIGURE 214.—Complete cleft of bony and soft palate.

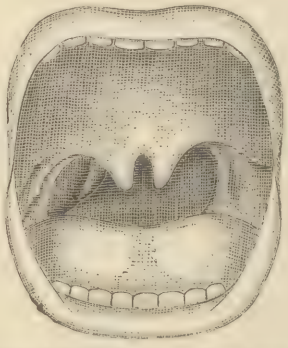

FIGURE 215.—Cleft involving hanging tip of palate.

not noticeable as a deformity when the patient's mouth is closed. It is only when he or she talks that the malformation is apparent. In all these cases there is always a peculiar nasal intonation of the voice. The patient appears to talk almost entirely through the nose, and articulation is sometimes so indistinct as to be scarcely intelligible. This state of things is easily explained on anatomical grounds. The soft curtain of the palate is an indispensable organ for perfect speech. It is so situated in the back part of the mouth as to be capable of shutting off communication either between the throat and nose or between the throat and mouth.

According to one or other of these motions of the palate, the sound of the voice can be made to go entirely through the nose or entirely through the mouth. When it is recollected that language is made up of distinct interruptions of sound, and that such interruptions can only be made by a perfect valve, the association of indistinct and imperfect speech, with a deficient or absent palate, can be easily understood. For instance, in pronouncing the consonant *D*, the column of sound should be entirely shut off from the nose, but when there is no palate to do this the nasal modification gives the sound of N. So, instead of the sound B we have that of M, while the articulation of K, G, and Ch become almost impossible. There is some imitation of this condition in an ordinary cold, when the palatal curtain becomes swollen, loses its pliability, and is unable, with promptness and accuracy, to effect a complete closure between the cavity of the throat and that of the nostrils.

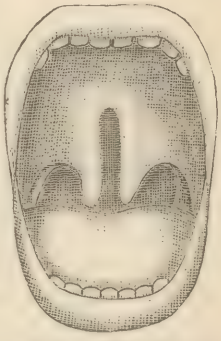

FIGURE 216.—Partial cleft of palate.

The treatment of cleft palate consists in the closure of the opening. How this is best accomplished is still a question. Many surgeons prefer to pare the edges of the split and unite them by suture. But even when this is successful there is still great difficulty with the palate thus formed in completely closing the opening between the throat and nose during articulation. The consequence is, that the patient, although much improved as regards the power of distinct articulation, still has much of the characteristic nasal tone. The operation requires great skill for its performance, and has been advocated and practised by the most experienced and accomplished surgeons in the world, but with indifferent success. The time for operation is generally selected when the patient is old enough to intelligently assist the surgeon.

Of late years the dentist's art has been brought into requisition in the treatment of these deformities. A plate is fitted to the roof of the mouth, thus closing any opening, be it more or less extensive. To this plate is attached a soft and exceedingly flexible rubber palate, which is acted upon by the muscles of the throat in such a manner as to cut off all communication between the cavities of the nose and those of the mouth, when such is required during articulation. It is quite possible, with these artificial palates and with proper education, not only to speak with perfect distinctness, but with little or none of the nasal tone.

Abscess.

An abscess is a collection of pus, or what is popularly called "matter," in any part of the body. It may be the result of an injury, or may appear without apparent cause. When the latter is the case, the abscess is generally supposed to be due to a so-called bad state of the blood. Whether the latter can be proven or not, it is certain that some changes in the general system are almost always associated with the appearance of collections of pus. The first symptoms of abscess are those which belong to any inflammatory action. They can be summed up under three heads—pain, heat, and swelling in the part affected. The pain is usually of an aching character, due to distention, is attended with throbbing, and is much aggravated by pressure. The heat is quite perceptible, and is limited to the extent of the inflammatory action. The swelling is somewhat circumscribed, but its edges are hard and inclined to leave sunken spots after pressure. In the centre of the swelling, "matter" forms after a while. The presence of pus is detected by placing one finger on one side of the abscess, while a slight tap is made by another finger on the opposite side. To the first finger a distinct wavy feel or impulse is communicated through the fluid. This is called fluctuation, and, when recognized, is a sign of fluid in a cavity.

Under favorable circumstances an abscess "breaks" and discharges itself. The natural tendency of the pus is in the direction of least resistance. At a given point the tissues become thin, the swelling becomes unduly prominent, and, finally, an opening forms, when there is a relief to all the symptoms. The color of healthy pus—that is, the discharge from a so-called healthy abscess—is of a yellowish color, of the thickness of ordinary cream, and of a slightly sweetish, musty odor. After the discharge has taken place the swelling decreases, the hardness of the surrounding tissue fades away, the redness disappears, the sac contracts, and the parts soon resume their natural shape, the opening being, of course, the last to heal.

But such a fortunate termination of an abscess does not always occur. Sometimes, the pus being deeply seated, the overlying tissues are too resistant to permit of its natural escape. Under such circumstances it burrows in different directions, causing a great deal of damage. A familiar example of this is the ordinary felon. In that case the abscess is formed next the bone, under the dense and tough tissues of the finger, and, if a timely escape is not made by a suitable incision, the "matter" finds its way into the palm

and back of the hand. The cutting of these binding tissues is the only safe course. In fact, it is always a good rule, so soon as pus is found, to open the abscess at once. It is well to remember, however, that this is a procedure which is not always a safe one in the hands of the novice. Although in superficial abscess matter overlies the large blood-vessels, there are sometimes exceptions to this rule which it is well to bear in mind.

When an abscess is situated in the neighborhood of large arteries or veins—for instance, on the front part of the neck, behind the jaw and under the ear, inside of the thigh, groin, armpit, or inside of the arm—it is safer, in the absence of a competent medical attendant, to allow nature to take her course, than run a risk of inviting dangerous bleeding by ignorant and unskilful handling of the lancet. Even cutting parallel with these vessels—as is the surgical rule—is an operation attended with the danger of wounding some of the larger branches which are united to the main trunk by different angles.

When an inflammatory swelling commences, an attempt may be made to arrest its progress by the application of cooling washes, or even by ice; but generally, when the symptoms are sufficiently urgent to claim the attention of the patient or to call for treatment, the period for the employment of such measures is past. Hence it is that the application of a poultice comes first in order. The latter may be made of bread and milk, flaxseed meal, or powdered slippery elm. The object of such treatment is the maintenance of heat and moisture. Consequently, so long as a poultice is warm and moist it is accomplishing all that can be expected of it.

The proper way to prepare a poultice is to mix the material thoroughly with hot water, and fold the mass in a cloth, so that no part of the material comes in direct contact with the skin. Sometimes a piece of ordinary mosquito netting is placed over the part of the poultice next the skin, and appropriately folded with the margins of the outer cloth.

As previously stated, abscess may occur in any part of the body; but its particular situation has a great deal to do with the symptoms which may be presented, or the mischief which may be produced. Generally, the more superficial the abscess and the more rapid its course, the greater is the heat and the more abrupt is the swelling. When deeply seated underneath a tough membrane, or fascia, pain is usually the symptom which claims most attention. Hence the great pain in the "felon," in "quinsy" sore throat, so-called "ulcerated" tooth, and other painful troubles.

The mischief done by an abscess is usually due to the confinement of the pus, and to the burrowing which is commonly an

associated condition. When the "matter" collects between the bone and the membrane, covering the latter, not only is there apt to be burrowing in the surrounding tissues, but the bone itself is liable to die at that point. Not only does this happen in the true felon, but in that condition of the leg which terminates in what is popularly called "fever-sores," but which is, in reality, nothing more than dead bone which keeps the ulcers open. Just so long as the dead bone is present will a discharge of matter continue. In this connection reference may be made to the occasional occurrence of persistent discharge of matter after the abscess has either opened itself, or has been lanced. When this is the case, either the abscess has not a free escape for its contents, or there is some irritating substance in its interior—such for instance as dead bone which prevents closure. The channel for escape of the pus is, under such circumstances, comparatively long and narrow, and is called a *sinus*. The latter is more apt to occur when there has been a delay in the evacuation of deep-seated pus, and when there has been extensive burrowing in consequence. If, after a reasonable time, the parts fail to heal, the sinus can be cured by removing the irritating substance at its bottom, and by slitting up its entire length, thus allowing it to heal as an ordinary ulceration.

While the majority of abscesses run an acute or rapid course, there are some that are exceedingly slow in their progress, give rise to very little redness, heat, or pain, the main symptom being the accumulation of pus. These are called chronic or cold abscesses, and are very often connected with disease of the spine. They show themselves most frequently in the back, in the region of the kidneys, or they burrow their way forward under the dense tissues inside the pelvis, and point in front in the fold of one or other groin. This condition of abscess is usually associated with a feeble state of the system, and requires the patient and persistent attention of a well qualified practitioner of medicine.

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Diseases of the General System, Etc.

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Vol. II.—53

DISEASES OF THE GENERAL SYSTEM, ETC.

Scurvy—Scorbutus.

This disease is caused by deprivation of vegetable food. Sailors, soldiers and prisoners are most liable to it, and it has been known to occur in countries where—as in Ireland—the failure of a potato crop deprived the inhabitants of the principal source of their food-supply. Scurvy is always apt to break out in armies encamped in large masses, and among the garrisons of fortified towns during their besiegement, and no amount of food of other kinds can be made to take the place of the missing vegetables.

The constant use of salted meats, and a monotonous diet have wrongly been claimed to produce the disease.

Symptoms.—The skin becomes pale, sallow, or muddy in color; there is increasing listlessness and disinclination to exercise or use the mind. Pains resembling rheumatism occur in the limbs; the face becomes puffy and the expression listless. The bowels are constipated but digestion is fairly well performed, and the appetite continues good for a time. Presently, reddish-brown spots, like flea-bites, appear on the skin of the arms and legs; vary in size; are not raised above the level of the adjoining skin, and cause no sense of discomfort. By and by their color changes so that they resemble bruises, and, indeed, are liable to be mistaken for them. The skin, generally, is dry and scales off readily.

The gums become swollen and soft or spongy, and in advanced stages of the disease the teeth become so loose as to be easily pulled out, being, apparently, held in place only by the puffy gums which swell up so as nearly to cover them, and which bleed upon the slightest injury.

The breath is extremely offensive, the flow of saliva profuse, and eating, even of soft foods, becomes almost impossible, owing to soreness of the mouth.

The slightest blow upon the skin causes a black-and-blue mark, and injuries which would at other times be trivial in importance, now cause open, ragged, burrowing sores, which may lead to exhaustive bleeding, owing to destruction of the walls of blood-vessels. There is difficulty of breathing and great prostration, during which attacks of faintness are easily produced, and are liable to end fatally.

Treatment.—Fresh vegetables—especially potatoes, onions, salads, and fresh fruits—should be given in as large quantities and in such forms as the patient can digest. Lemonade, oranges, and limes are of great value. Medicines are, by comparison, almost useless, although the citrate or tartrate of potash, and vinegar are sometimes found to ameliorate the symptoms.

In the English marine service, all ship-captains are required to provide lime-juice preserved by means of a small amount of brandy or rum (ten per cent. of the whole), and sealing it tightly in bottles. This they are required to issue to their crews to the amount of four tablespoonfuls for each man, twice a week during the voyage, and to increase the quantity if signs of scurvy appear. During the war of 1861–65 in this country, a considerable amount of sickness was caused by scurvy, although in the Southern States when fresh vegetables failed, the fruit of the prickly pear—a variety of cactus—sometimes served, when roasted, to take the place of accustomed vegetables and fruits. Potatoes have been known to replace money in bartering for the commodities of camps, and their fortunate possessors have often scraped and eaten them raw as morsels of the greatest delicacy.

Anæmia—Chlorosis.

These conditions are due to a deficiency in some elements of the blood, and their causes are various. Among physicians, a distinction is made between them, but for most practical purposes they are the same.

There may be actual deficiency of blood—as when there is bleeding from a wound, from piles, from excessive menstruation, nose-bleed, vomiting of blood, etc., or there may be a profuse discharge of matter from some sore which exhausts the system. On the other hand, while there may be no excessive waste, there may be deficiency of food, or indigestion of that which is taken, so that the elements of the blood fail to be renewed as they are consumed by the tissues. Deprivation of sunlight, chronic disease of vital organs, overwork, excessive use of alcoholic drinks, and a number of other causes may lead to these conditions.

The variety of blood-impoverishment known as chlorosis is especially liable to occur among girls at the age of puberty, and women suffering from menstrual derangements.

Symptoms.—These are headache—not very severe, but pretty constant and relieved by lying down ; shortness of breath ; palpitation of the heart after even slight exertion—such as going upstairs ; a feeling of constant weariness and inclination to sleep ; inability to do manual or mental work ; loss of appetite ; costiveness; thick, muddy-looking and scanty urine ; cold extremities and paleness of the skin in parts that are not tanned by exposure to sunlight. There is usually an appearance of floating spots before the eyes, and a sensation of noises like a distant rumble of carriages, or the roar of a waterfall. The feet are frequently swollen. Most of these symptoms are relieved, for a time, after eating or after taking an alcoholic stimulant.

Treatment.—A sufficiency of good and digestible food, warm clothing, exposure to sunlight, change of air and relief from worry and overwork will generally accomplish a cure in many cases if combined with the internal use of iron. When the trouble is, however, owing to loss of blood or to excessive discharges, these must be stopped before recovery can take place.

Among the preparations of iron, the following are to be recommended :

Solution of dialyzed iron, fifteen drops for an adult, taken at intervals of five or six hours and when the stomach is empty, in a half-wineglassful of water. Tincture of the muriate of iron, in similar doses, but after meals, and with the additional precaution to use a glass tube through which to suck it, and rinsing the mouth afterward. Pills of the sulphate of iron containing about two to four grains each, taken after eating, or, when there is loss of appetite, pills of three or four grains of citrate of iron and quinia. These can be made by any apothecary.

Rheumatism.

The essential nature and causes of this disease are but little understood. A liability to its attacks is characteristic of the members of certain families, while others never suffer from it. In some instances it has been presumed to be owing to the presence in the blood of certain products of indigestion, or of nutritive changes in the tissues of the body. In other instances it follows attacks of gonorrhœa or scarlet fever. Those who are liable to have it are often attacked after exposure to wet or cold. Prolonged residence in damp situations and changeable climates may lead to its devel-

opment in those who might otherwise have escaped. The disease occurs in several forms; besides gonorrhœal or scarlatinal rheumatism, there are acute rheumatism or rheumatic fever, subacute rheumatism, chronic rheumatism, muscular rheumatism, deforming rheumatism or rheumatic arthritis, and rheumatic gout.

Acute Rheumatism.

This variety is most common between the ages of fifteen and twenty, although it is rarely found in infants and more often in middle life, and it affects males more commonly than females.

Causes.—The most common *exciting* causes are getting wet or cold, and delaying to change the clothing and secure warmth. Persons who are liable to it do not tolerate damp surroundings, and it has often been observed that with such persons even the use of ordinary baths sometimes causes trouble. In many cases the outbreak can be traced to no apparent cause unless it be an attack of indigestion or some disturbance of the general health.

Few persons die of the immediate effects of the disease, although it may cause high fever and excruciating pain. The chief danger lies in the liability to inflammation of the membranes which line or cover the heart, or of the muscular substance of the heart. Another of the results sometimes attributed to it in the case of young children, is the production of St. Vitus's dance, or chorea.

Symptoms.—An attack of rheumatic fever commonly begins with chilliness. After a few hours or a day or two, there is fever, throbbing headache, thirst, and high-colored urine. About this time one of the large joints—most often it is the knee—becomes swollen, painful, red, hot to the touch, and stiff, and the patient loses completely the use of the limb. Confinement in bed becomes imperative; the fever increases and the skin becomes covered with a profuse and peculiar, sour-smelling sweat. The slightest movement—even jarring of the bed by some one who walks across the floor—causes pain; the tongue is covered with a thick, white fur; appetite is lost; the bowels are constipated; the urine becomes scanty and deposits a "brick-dust" sediment, and sleep is rendered short and difficult to obtain in consequence of paroxysms of pain.

Not unfrequently, in the midst of an attack, the pain and swelling of the joint disappear, to reappear soon after in some other joint, and so the seat of the disease may change from one to another until a number of them have been affected.

An attack of acute rheumatism may last almost any length of time from five or six days to as many weeks, but three weeks is about the usual period, and a person who has once been attacked is more and more liable to subsequent seizures.

Treatment.—The patient should be wrapped in the softest and most "fluffy" woollen blanket obtainable, and this must be changed, should it become wet, with care against leaving the skin uncovered. Milk, broths, gruels, and various starchy foods in fluid forms, are the best diet during the height of an attack. Iced water, or carbonated alkaline waters, lemonade, and cream-of-tartar water, may be used to allay thirst.

Lemon-juice, in as large quantities as can be taken with comfort, has long been resorted to as a remedy, and so, also, have alkalies—like the acetate of potash, in doses of thirty grains given every four hours in a half-glass of water, or Rochelle salt, in doses of a half-teaspoonful in water, every two or three hours.

Of all the remedies that have been used for the relief of acute rheumatism, none approach so nearly to being a specific as salicine and its compounds, such as salicylic acid and salicylate of soda. The former is most agreeable to take ; the latter is cheapest, and is less irritant to the stomach than salicylic acid. Fifteen grains of salicylate of soda may be taken every two hours until the fever and pain in the joint subside, which will commonly be within twenty-four hours. Its use then needs to be continued in similar doses, but at intervals of four to six hours. Salicylate of soda is best given in capsules, or wrapped in wafer or tissue paper.

Tincture of aconite, in doses of a half-drop every fifteen or twenty minutes (for an adult), will sometimes prove useful at the commencement of an attack.

When the pain is severe, tincture of opium may be cautiously used, in doses of ten to fifteen drops in water, every hour or two, until it causes drowsiness or relieves the pain.

When the fever is high, the body—so far as its surface can be reached without disturbing the patient—may be sponged every hour with tepid water.

No case of acute rheumatism should be treated without the aid of a physician, if one can be obtained.

After recovery, the patient can render the chances of subsequent attacks less by wearing *always* woollen undergarments and avoiding exposure to wet and cold.

The rheumatism following gonorrhœa and scarlet fever had better be treated by a physician, if one is to be had.

Subacute Rheumatism.

This variety is liable to occur in those who have previously suffered from acute attacks. While there may be considerable soreness of joints or muscles, there is rarely much fever.

Its Treatment resembles, in a general way, that of the acute variety.

Chronic Rheumatism.

This is the form most commonly met with in old people, and not unfrequently it has never been preceded by a well-marked acute attack, but as age increases, pains in the joints and muscles, especially at night, become more and more troublesome. The joints are rarely red or tender, as in the acute form, but are swollen and stiff. The stiffness is especially noticeable when the joints have long remained in one position. Owing to the fact that the pain is usually worse at night it is sometimes confounded with syphilitic disease of the bones and periosteum. It affects chiefly the large joints at various times, and gives most trouble to people who are liable to exposure in stormy weather; whose dwellings are damp; whose clothing is scanty and during sudden changes from warm to cold and damp winds.

Treatment.—Little can be accomplished unless the patient secures warm clothing and a dry habitation, although cases occur among those who are abundantly provided in these respects. Hot flannels, or hot-water bags, and wrapping the affected joints in oiled silk or gutta-percha tissue, usually palliate the local symptoms. When the pains are worst at night, iodide of potassium, in doses of seven to fifteen grains, three times daily, in water, will often give relief. Salicylate of soda, given as directed on the preceeding page, will occasionally be serviceable. Tincture of rhus toxicodendron, in doses of a drop or two in water every couple of hours, is recommended when the lower limbs are affected and are painful while at rest, and the tincture of black cohosh, in doses of three to five drops in water, every two or three hours, is another remedy which often proves serviceable. Ammoniated tincture of guaiacum, given in half-teaspoonful doses in milk, every four to six hours, is an old remedy.

Liniments of any kind, which, together with rubbing, render the skin red at the seat of chronic rheumatic pain, will frequently give some relief. Small blisters—not more than an inch square—applied successively at different places about a tender joint, are sometimes useful.

Many persons find great relief to follow an annual visit to some sulphur spring, where they drink the water and take a series of baths.

The Turkish bath is among the most valuable remedies when it is obtainable.

Crick in the Back—Lumbago.

This is considered to be a rheumatic affection of the muscles of the back, but it is quite as likely, in many cases, to be a neuralgia. The same may be said of many cases of so-called muscular rheumatism of other localities.

When the muscles of the back are the parts affected, there is a dull, dragging pain and some soreness, at times, and efforts to move the spinal column in any direction cause sharp paroxysms of pain. The patient, on standing, is obliged to bend forward, and efforts to stand upright, or to pick objects from the ground, are rendered almost impossible on account of the suffering which they cause.

Treatment.—The remedies useful for neuralgia are usually serviceable in this affection. Much comfort follows the application of a hot poultice to the back, or the wearing of a broad bandage of stout flannel pinned tightly about the loins after placing a piece of oiled-silk next to the skin. Galvanism is often serviceable.

The best remedy that has yet been discovered is the insertion, for a moment, of a sharp needle—like a shawl or bonnet-pin—to the depth of about an inch, into the skin and muscles at the points that are most painful. The relief which usually follows this little operation is immediate and almost miraculous.

Crick in the Neck.

This is, to all intents, similar to the foregoing, the muscles of the neck, instead of those of the back, being the seat of the trouble.

The use of stimulating liniments (see Formulas), the application of oiled silk, flannel, hot poultices, and capsicum plasters, with rest, are the best remedies. Owing to the presence in the neck of large blood-vessels and nerves, the puncture-treatment should only be undertaken by a doctor.

Deforming Rheumatism.

There is a peculiar affection known as "deforming rheumatism," "rheumatic arthritis," or "rheumatic gout," which is observed among persons of all ages, though most often among

adults. Females, and more particularly women who suffer from menstrual disturbances, are said to be most frequently attacked. It is not hereditary, and is not apparently caused by alcoholic drinks, or excessive feeding. It rarely presents the inflammatory symptoms and disturbance of general health noticeable in rheumatic fever, but when once a joint is affected by it, the swelling, tenderness and stiffness continue, and joint after joint becomes involved. Not unfrequently it is mistaken for gout, but it is to be noted that the great toes, which so often are the seat of gouty trouble, are among the least frequent seats of the disease in this malady. Moreover, gout most often attacks small joints, while rheumatic arthritis attacks large and small alike. While none of the other forms of rheumatism are ordinarily followed by permanent deformity, this is a leading symptom of the variety in question, and the joints attacked become more and more distorted and surrounded with bony outgrowths, until the patient is rendered a helpless cripple.

Treatment.—This is at best a very intractable malady, and very many cases are not influenced, apparently, by anything that can be done. The measures mentioned under the head of chronic rheumatism may be resorted to for temporary comfort, and a course of life should be adopted which will aid in the preservation of the general health. All else should be left to a physician.

Gout.

Gout is almost entirely a disease of adult life, and is most common among men, women being but very infrequently attacked. It is decidedly hereditary, but it can be developed by over-eating, by the constant use of sweet wines and malt liquors, sedentary occupations, and a deficiency of muscular exercise. Its attacks are often sudden, or preceded only by disturbance of the stomach and notable irritability of temper. Persons liable to it may have an attack brought on by over-indulgence of the appetite, by over-fatigue—especially too much walking—and by mental depression from any cause. The first attacks are usually confined to the small joints, and of these, the joints of the great toes are most liable, but in chronic cases all joints may become implicated.

Symptoms.—As before mentioned, the onset is sudden and very frequently occurs during the night, when the patient is awakened with pain. In the case of the great toe, the joint becomes swollen, red, hot, and so tender as to endure no pressure whatever, and prevent the foot being placed on the floor. The pain is usually of

a burning or crushing character; the veins above the joint are swollen; the patient is restless and irritable, and sometimes—though not invariably—there may be feverishness, loss of appetite, a coated tongue, and constipated bowels. The pain is commonly worse toward evening and through the night. The usual duration of an acute attack is from five to ten days, according to the care taken. At the end of the attack the pain and swelling subside, and the outer layer of the overstretched skin peels off. By and by the joint can be used, and the patient feels generally better than he did for some time before the attack.

Unless proper precautions are taken, one attack of gout is pretty sure to be followed by another. The intervals may, at first, extend over two or three years, but in time they become shorter, and recur at about the same time each year. As the attacks become more frequent, their duration increases, until the patient suffers almost constantly, excepting a short period during the hot weather of summer.

Matter very rarely forms in gouty joints, but there is deposited in them a substance known as urate of soda, which at first is soft and creamy, but afterward grows hard and chalky, until, in cases of oft-repeated gout, the joints, especially of the fingers and toes, present hard lumps, over which the skin is stretched, and may finally ulcerate, leaving these "chalk-stones," as they are wrongly termed, exposed.

During an attack, the urine becomes scanty, high-colored, and has a pink or red sediment.

Treatment.—The patient should remain as quiet as possible in a warm room. The joint should be closely wrapped in oiled silk and cotton-wool or flannel, and when the foot or hand is the part affected, it should be kept in a horizontal position on a soft pillow.

The diet should be rather spare and consist largely of fluids. The medicine which usually affords relief is the tincture or wine of colchicum, either of which may be taken in doses of a half-teaspoonful, in water, every two hours, until the pain is relieved. Colchicum usually acts best when it is preceded by a dose of Epsom salt, or some similar saline laxative.

In cases that are somewhat chronic, iodide of potassium may be of service in doses of seven to fourteen grains taken in a half-wineglassful of water every six hours.

A physician should be consulted in regard to the treatment of individual cases, and he should lay out a course of diet, exercise, etc., which should be closely adhered to during the intervals between attacks.

Dropsy.

The general characteristics of this condition have already been mentioned in other parts of this work, and we shall here consider some of the causes and varieties of dropsy in greater detail.

All the blood which has passed through the capillary circulation of the intestines—stomach, spleen and pancreas—is collected by venous trunks which empty into the portal vein. After entering the liver, this again subdivides so as to form a second capillary network, which surrounds each of the lobules, or small divisions of the liver-substance. From this area the blood is again collected into branches of the hepatic veins, and is then discharged into one of the great veins which empty into the right side of the heart. Any impediment to the passage of blood through the capillary vessels of the liver naturally leads to an overfulness of the blood-vessels which empty into the portal vein, and a natural consequence is an oozing out of the fluid portion of the blood, which fluid collects in the cavity of the belly and gives rise to the form of dropsy called *ascites*.

When the obstruction to the blood-current exists in the heart or lungs, and over-distention of the veins takes place, the oozing out of the blood-serum is more general, and is likely to take place at points where the pressure against the walls of the vessels is greatest. This, of course, is the case in the lower extremities and in places where the connective tissue is loose in texture and offers little support to the vessels contained in it. In heart-diseases, therefore, swelling of the feet, ankles, and hands occurs during the day, and disappears more or less completely during the night when the limbs are on a level with other portions of the body.

In certain varieties of kidney-disease, a diminution in the quantity of fluid excreted by these glands leads to overfulness of the blood-vessels, while, at the same time, the blood-vessels themselves may be the seat of disease, which renders them less able to retain their contents.

In pregnant women, the pressure of the enlarged uterus against the veins passing through the pelvis, causes obstruction to the passage of blood, and the lower limbs swell in consequence.

Not uncommonly, the watery state of the blood in anæmia, and the deficient nourishment of the blood-vessels, as well as other parts of the body, leads to an escape of serous fluid into various localities in the body.

Embolism, or other cause arresting the flow of blood in an artery, leads to œdema or dropsy of the parts beyond, in consequence

of the weakening of the coats of the vessels whose supply of fresh blood has thus been cut off.

Certain affections of the nervous system which paralyze the muscular coats of the arteries, favor an over-supply of blood to corresponding portions of the capillary vessels, and thus dropsy of the adjoining tissues is produced.

The serous sacs—like the pleura, pericardium, and peritoneum—are liable to accumulations of fluid as a result of inflammation.

The Symptoms of dropsy or œdema are commonly very apparent. When it takes place in the connective tissue of the limbs, pressure with the end of a finger over some firm point—like the shin—squeezes the fluid out of the connective tissue underlying the skin, and a pit or hollow remains for a time.

When dropsy of the belly takes place, the swelling may become extremely great, and the descent of the diaphragm during breathing be interfered with. When lying on the back the fluid causes the sides of the belly to bulge, and by placing a hand on one side, while a gentle tap is struck with the fingers on the other side, a wave-like impulse of the contained fluid may readily be felt.

Treatment.—When the cause of the dropsy can be removed (as in pregnancy, by supporting the womb with a bandage slung from the shoulders, or by lying on the face), no other treatment is needed. When the swelling is due to disease of the liver or kidneys, however, the removal of the cause is not always possible. The same is true in some heart affections; although not unfrequently, when the action of the heart is feeble, the use of digitalis, tonics, and other means which increase its power, will lessen the amount of dropsical fluid.

In anæmia, iron, fresh air, nourishing food, and the moderate use of stimulants, will greatly help to put an end to the trouble.

When in dropsy of the extremities, or *anasarca*, the skin is so overstretched as to become painful, and even when the swelling is less in degree, much relief follows the wearing of a well-fitting roller-bandage, or an elastic bandage will afford great comfort.

Occasionally it is thought necessary to puncture the skin with a needle or lancet at various points, to permit an escape of the fluid. Owing to the bloodless state of the skin from over-stretching and narrowing of its vessels, this is liable to be followed by the formation of sores.

When fluid accumulates in the abdominal cavity to such an extent as to interfere with the action of the lungs, heart, stomach, intestine, or kidneys, it becomes necessary to draw it off through a tube—an operation which gives but trifling pain, and is unattended with much risk if properly performed.

A moderate amount of fluid may be carried off when the over-distention of the blood-vessels is lessened by means of purgatives and production of sweating. To accomplish these, elaterium, croton-oil, compound jalap-powder, and jaborandi, and hot-air baths are administered, but should not be undertaken without the direction of a physician. Remedies which act upon the kidneys are not often successful in lessening dropsy.

Sunstroke.

Sunstroke, or *heat-stroke*, as it would be more proper to call it, is not due to exposure to the sun's rays alone, but follows the prolonged effect of heat from any cause, when this is combined with exhaustion from overwork or sickness, bad air, a sultry atmosphere, an inactive skin, and the use of alcoholic drinks; laborers, soldiers, emigrants on crowded vessels, those who are exposed to intense heat in their occupations—such as glass-blowers, smelters, moulders of metal, laundresses, bakers, &c., are among the persons most liable. The attack does not always occur during the daytime, but may come on at night. Preceding it the person has usually suffered more or less from loss of appetite or nausea, exhaustion, inability to hold the urine for any considerable length of time, headache, dizziness or confusion of ideas, a dry skin; and the use of a thermometer in the arm-pit will show the existence of fever.

Symptoms.—The onset may be quite sudden and take the form of an active delirium, during which the patient rushes about and may even attack those who would restrain him, or he becomes suddenly weak and sinks to the ground in a condition of stupor. At this time the temperature in the armpit will be found to have risen to 106° or 107° Fahr. and the pulse will have become feeble. Other cases are not attended with loss of consciousness, but there is great weakness, a feeble pulse, and cold, clammy face and extremities.

Persons who have once suffered from sunstroke rarely ever recover entirely from its effect on the brain, but suffer from headache and loss of memory. Those who are liable to epilepsy, not unfrequently have the disease developed by it.

Treatment.—Those who are not in good health, and who feel the early symptoms of the attack coming on, should immediately retire to a cool, airy, darkened room, apply cold water to the head, lie quietly in bed, take thirty grains of bromide of potassium in cold water, to relieve headache, and put mustard drafts on the insides of the thighs, or have a hot foot-bath.

When a person is attacked suddenly, carry him at once to a cool place in the shade, and after taking off the outer clothing, pour cold water on the head and over the entire body. If the skin is very hot and dry, ice may be put into the water, and an ordinary garden sprinkling-pot may be used.

Do not allow blood to be drawn under any circumstances. If there is much delirium, a long mustard plaster may be put on the back over the spine. Convulsions, which are apt to occur in severe cases, may ordinarily be arrested by giving inhalations of chloroform. For this purpose a teaspoonful may be put on a folded handkerchief or napkin, and held a short distance above the nose and mouth. If the pulse is feeble, use smelling-salts with care.

Send for a physician in *any* case.

Sea-Sickness.

This is commonly considered to be a disturbance of the digestive organs, owing to vertigo, nausea, and vomiting being prominent symptoms, but it is probably due to some derangement of the nervous system; the nausea and dizziness being attendant upon the disturbance of the brain, such as occurs in riding backward, swinging, whirling, blows upon the head, etc. Most persons are liable to it, and even old sailors suffer at times when the sea is rough. Not unfrequently, when a ship, an iceberg, or some novel sight attract attention; when imminent shipwreck, or a man overboard cause intense excitement, or when land appears in sight, even those who have suffered most, often lose at once the sense of utter wretchedness which a moment before rendered mere existence intolerable.

Sea-sickness has a number of varieties. At times there is no nausea, but a feeling of constant dizziness, confusion of ideas, and, perhaps, a dull headache take its place. Even in such cases there is more or less loss of appetite, and in nearly all there is obstinate constipation. Without doubt the close and unsavory atmosphere of a vessel plays an important part in the production of the nausea, since even those who are not, ordinarily, much affected, may lose control of their stomachs if they venture into the neighborhood of the cook's galley.

Intense as the suffering may often be, it is rarely that the malady ends fatally. The prolonged absence from food and the prostration which follows the nausea and retching, frequently weaken those who do not soon become accustomed to the movements of the vessel, and persons who are already weakened by disease may sometimes suffer fatal injury. For some reason con-

sumptive persons appear to be less subject to sea-sickness than most others.

Treatment.—The long list of remedies at one time or another recommended for sea-sickness is sufficient evidence that there are no specifics. Almost every traveller has tried a number of them without benefit, and has at last settled down in a condition of mental apathy, to await the deliverance which comes with reaching land.

When an ocean voyage is to be made, arrange your affairs so that nothing shall need to be done for twenty-four hours previous to going on board. Take a dose of some purgative that will empty the bowel, and when the time for going to the vessel comes, do it without excitement. Take a farewell of friends before going on board, and make use of the time that precedes starting, by arranging clothing, toilet articles, knick-knacks, etc., where they can be reached without fumbling, and fix them securely to prevent their being dislodged by the motions of the ship. Leave all flowers in the saloon, and try to keep the air of the stateroom dry and entirely free from *all* odors, agreeable or otherwise.

Provide extra wraps that will keep out wind and cold: they will never be too warm, even in mid-summer, when going to and from European ports, and, with their protection, stay on deck, as near the centre of the vessel as possible, even if you are obliged to lie on the deck and have meals brought to you. When you go below, go directly to your stateroom and lie down with as little delay as possible. Have your pillow toward the forward end of the vessel, and fix all curtains, garments, etc., so that they cannot swing. Eat sparingly at first, and have the food either hot or ice-cold, and *well* seasoned. Those articles which have a decided flavor are best retained. A cracker spread with butter, sprinkled with cayenne pepper, and eaten with a piece of smoked herring or sardines and lemon-juice, pickled oysters, a *thin* slice of cold boiled ham, or smoked tongue with spiced mustard, are often dainty bits on shipboard.

When walking on deck, keep on the side toward the wind, or along the middle; don't look at the rigging, but keep the eyes fixed on the horizon, which is about the only object that does not appear to be in constant motion; and do not walk too near the after-end of the vessel. The up-and-down motion is there sometimes very great, and will pretty certainly cause vomiting in those who are "squalmish."

The headache and dizziness can sometimes be relieved by bromide of sodium or of potassium, in doses of twenty to thirty grains for an adult, taken in water, and repeated at intervals of

four to six hours. Chloral hydrate sometimes proves serviceable in short trips by putting the sufferer to sleep, but should be used only with the advice of a physician. Nitrite of amyl can now be had in most large seaports, put up in little thin glass capsules containing three to five drops each. One of these may be crushed in a handkerchief or napkin and its vapor inhaled. This remedy acts best in cases where there is not flushing of the face and headache, but where there is pallor, nausea, and a cold surface. The dose should not be repeated oftener than every two or three hours, and it is better to consult a physician before using it. With some persons, lumps of ice swallowed whole are grateful. Others use a small quantity at a time of iced *dry* champagne—that is, champagne having but little sugar in it. And for this purpose one of the forms of bottle-tap will economize the champagne, and facilitate its being drawn as needed.

Those who are able to be on deck often derive much comfort from a stout, broad, flannel bandage, made with buckles and straps, so that it can be secured firmly about the abdomen. This should be put on next to the outer garments ordinarily worn, so that it can easily be taken off while lying down, and put on before rising.

Swinging berths are from time to time recommended, but unless they are suspended at the point in the vessel where the up-and-down motion is the least, viz., a little behind the centre, they are practically useless to prevent sea-sickness, although they avoid the uncomfortable rolling from side to side in the berth during rough weather.

Whooping-Cough—Pertussis.

This affection properly belongs among the Acute Infectious Diseases. It is a disease of the general system, and is not confined to the respiratory organs. Its most characteristic symptom (from which it gets its name) is a "whoop" or crowing sound made when the breath is drawn after an attack of coughing. The cough itself is peculiar, as it consists of a number of expulsive efforts without intermediate inspiration, and when it is long continued the face becomes swollen and red, the lips bluish, and sometimes the nose bleeds in consequence of the congestion of the head. The disease is rather more infectious than measles, and is most common among children, for the reason, probably, that all persons are liable to have it once, and are usually exposed to its influence before they have lived many years. It is sometimes observed to follow measles in epidemics of the latter disease. The period which intervenes between exposure to infection and the develop-

ment of the cough, is usually about four days. The first stage of the disease or the simple cough, lasts ordinarily from one to two weeks, the second stage, characterized by spasmodic cough, may continue from two to three weeks, even longer, and not unfrequently it is three to six months before the cough has quite disappeared.

The infectiousness of the disease is probably greatest during its early stages; toward the end the whoop appears to be continued in consequence of an acquired disturbance of the nervous system.

Simple cases of whooping-cough rarely end fatally, but there is liability to complications, such as inflammation of the small air-tubes, pneumonia, convulsions, diarrhœa, etc., which render some cases much more serious. Not unfrequently, tubercle of the brain and disease of the spinal column are to be traced to an attack of whooping-cough as their starting-point.

Symptoms.—The disease almost always commences with a cough which is not distinguishable from that of a common cold or a bronchitis, and after this has continued a week or two, it acquires the spasmodic character above described; a little later the whooping inspiration is developed, and any excitement, such as violent or quick movements, or disturbance of the emotions, is apt to bring about a paroxysm. When the disease has reached this stage, the child instinctively grasps some steady object for support when it feels a paroxysm coming on, or it drops at once to the floor. At the height of this stage, the paroxysms may be as frequent as once an hour, and may prevent sufficient sleep. Each paroxysm is usually terminated with the spitting out (or swallowing) of a quantity of tough, stringy mucus that has been expelled from the air-tubes, and not unfrequently it also causes vomiting to such an extent, that the child suffers for want of nourishment.

After the second stage has lasted for the period mentioned, the frequency and severity of the paroxysms decline, and the matter coughed up more nearly resembles that which belongs to the last stage of an ordinary cold. During this stage the whoop may remain, although the spasmodic cough has disappeared.

Treatment.—In the early stages the same treatment may be pursued that has been recommended in other portions of this work when speaking of bronchitis and common cold. It is advisable to cover the chest with a jacket of cotton-wadding or oiled silk, and once or twice a day, especially at night, on going to bed, to give an emetic of a teaspoonful or two of syrup of ipecac to small children who do not readily cough up the mucus in their air-tubes.

Opium should not be given in any stage of the disease, and the only remedy which will here be recommended is the bromide of ammonium, or of sodium, given with water and in doses of five grains to a child one year old. This may be repeated at intervals of three hours.

Belladonna, sulphate of zinc, black cohosh, and numerous other remedies have been recommended for the relief of the second stage; but it is better to leave the directions respecting their employment to a physician.

When the disease is prolonged, and the child's health has suffered, a change of air is among the most valuable measures. In addition to this, such tonics as a physician can best prescribe will hasten a return to health. It has become customary for those who live in cities or towns where gas-works are established, to send their children, during the last stage of whooping-cough, to breathe the air of the rooms in which the "purifying apparatus" is located. In many cases this appears to be serviceable in stopping the whoop.

F. A. CASTLE, M.D.

Nursing, and Diet for the Sick.

NURSING.

THE kind of care which is taken of an invalid during most attacks of severe illness, may have a very decided influence upon the favorable or unfavorable course of the sickness. In most cases the exercise of proper attention will prevent many of the annoyances and discomforts which are suffered both by the patient and the family. It is a common belief that the nursing of those who are strongly attached to an invalid by ties of affection is more valuable and agreeable than services rendered by a stranger. This may be very true when the stranger lacks both skill and a friendly interest. As a rule, however, the worst kind of nursing is that received from friends and relatives, and in many instances the recovery of the patient depends, in a large degree, upon his being separated from those who are unable to conceal their solicitude, whose sympathies prevent the exercise of their judgment, or whose inability to properly perform their labor causes the patient to suffer mental distress, as well as bodily discomfort, and leads to the suppression of wishes that might better be gratified. Another evil effect of amateur nursing is often seen in the injury to the health of those who undertake it without the capacity for enduring the anxiety and fatigue which come from their constant presence with the invalid. In most cases of illness among children, the mother or some other member of the family make the best nurses, for reasons that are apparent.

The number of those who are able to avail themselves of trained nursing in all cases of sickness, is, however, comparatively few, nor is it every case that demands the constant exercise of the best skill and judgment. In cases of prolonged illness, such as fevers, brain, lung, heart, and kidney affections, and following severe injuries or surgical operations, the choice of a person who is to take the *sole* charge of the nursing is a matter of great importance. In such cases there should always be but one person who receives the directions of the doctor, and who is responsible to him for the

manner in which they are carried out. When it becomes necessary for this person to be absent, whether to sleep, eat, or secure a change of air and exercise out of doors, some *one* should be left with the patient who can be trusted to carry out instructions until the nurse returns.

As a rule, women make better nurses than do men, and strong, healthy women, between the ages of twenty-five and thirty-five, are usually the best. No one is a "born nurse," but those who possess good judgment, a fair degree, at least, of education, a cheerful manner, tidy habits, dexterity in doing their work, good digestion, and the habit of thinking beforehand and to themselves, are capable of *becoming* good nurses if they have the proper training. There is hardly a profession in which there are so many occasions for exercising all of these qualities as in that of nursing, and the actual number of those who possess them is very few indeed.

FIGURE 217.—Nurse's dress as adopted by most training-schools.

While physical strength may be very desirable, its possession is not always essential, since, for its exercise, the services of others can ordinarily be depended upon when needed, and there are those who, though muscularly feeble, are strong in constitution, and capable, in other ways, of making excellent nurses. In a number of our large cities, training-schools for nurses have been established in connection with hospitals, and the opportunities for thus acquiring a knowledge of the details of good nursing are becoming much better than formerly.

A few words in regard to the clothing and habits of a nurse may not be amiss here.

Nurses' Dress.—This should be of some material that does not rustle, is not easily injured, that has no pronounced pattern or color, and that will bear frequent and thorough washing; without doubt a dark calico is best. Black dresses, and garments so made as to interfere with free motion of the wearer, or likely to catch the

furniture, trail on the floor, or overturn objects placed on tables or stands, are to be avoided. In hospitals it is customary for nurses to wear broad linen wristbands that fit the arms closely, a plain collar, a white muslin cap to confine the hair, and a large apron. Jewelry of all kinds should be avoided; shoes should be free from noise, stout, and firmly fixed to the feet, and when night-work is demanded, a closely-fitting woollen sack, and not a shawl, should be put on to prevent catching cold when getting out of bed to attend to a patient's wants.

Every one who undertakes nursing will find it useful to hang a pair of scissors and a pin-ball from her apron-string, and to have a watch with a minute-hand, a clinical thermometer, and a box of matches in her pocket.

Talking.—Never talk unnecessarily to a sick person, nor "think aloud." When it is time to give food or medicine, never ask a patient if he does not think he ought to take this or that, or if he would like something or another, but get it ready, take it to him and say "Here is your medicine," "Now let us see how much of this you can eat," or some other expression that will attract attention, and require as little exercise as possible of judgment on his part. Don't, as a rule, ask *sympathizing* questions, or such as "Do you feel comfortable?" "Are your pillows right?" "I hope your head doesn't ache as badly?" "Is not the room a little cold?" But, so far as you are able, use your own wits and quietly put the pillows so that they afford rest, look at the thermometer, judge from the expression of the face and the motions of the patient whether the head aches, and say something else, if anything.

When a patient is able to bear conversation, and when a little, now and then, will serve to distract the mind from present troubles, **never** tell of other cases that you have seen, nor of the various persons whom you have known to be sick in similar ways, nor gossip, nor recount your own troubles, nor encourage the patient to talk of family affairs or of matters that will be liable to cause excitement. Moreover, *never* tell to others the things which, in feebleness of judgment, a patient may sometimes say respecting the affairs of himself or others, if there is the slightest reason for thinking that they may better be kept private. Never praise the superior skill of other medical advisers than the one in charge, nor recommend to the patient or friends measures or remedies that may be very excellent, perhaps; but remember that a nurse's duty is to carry out the doctor's orders. If you have any suggestion to offer, make it to the doctor himself, and privately. If it is a reasonable suggestion, he will appreciate your discretion and be obliged to you for it. Never ask the doctor, in the presence of a

patient, respecting the nature of any symptom, or for an expression of his opinion on any subject connected with the patient's condition. Never whisper in the patient's presence, nor talk in a low tone just outside the door, or where the voice and not the words can be distinguished by the sick person. Talking in an ordinary tone *about matters that are essential* rarely causes disturbance.

Noise in or about the sick room is always objectionable, and is particularly aggravating when the patient feels that a little forethought might have avoided it. Outside noises that result from necessary pursuits and occupations, rarely cause as much annoyance as those which come from boisterous children, pianoforte practising, rocking-chairs, carpet-nailing, and the like. Squeaking shoes, rattling the tongs and poker, squeaking and slamming doors and shutters, rattling windows and noisy chimney cowls and ventilators should always be prevented.

Never allow a rocking-chair in the room of a sick person, unless it be for his or her *exclusive* use. At other times keep it where people cannot sit in it nor stumble over its feet.

Visitors should not be allowed in cases of severe illness, without the doctor's permission, and the patient should be asked whether he will see them before they are admitted. Tell such visitors, before they go into the room, that they must not sit on nor lean against the bed, nor stand about the room, but take a substantial chair and sit quietly near the bed, in a position where they can easily be seen and heard. They should also be told how many minutes they may stay, and sometimes it may be advisable to say pleasantly to them, that there must be no relation of distressing experiences in similar cases, unpleasant or startling news of any kind, or recommendation of remedies, food, or doctors. Whatever they may have to say on such topics, can be said to other members of the family and elsewhere. The only excuse there can be for making the visit at all, is that it may relieve anxiety, or cheer and encourage the patient, and persons who do not exert such an influence, had better communicate with the patient through a third person.

It is very common for friends to "run in" and sit awhile with a sick person, when the nurse is obliged to be away to get rest or out-of-door exercise. Unless you are reasonably certain that the person so left in charge is likely to refrain from gossip, long stories, and injudicious remarks, it will, for some reasons, be better to leave many invalids entirely alone, particularly if they can be got to sleep in the meanwhile.

Rest and Exercise.—A nurse owes it to herself as well as to her patient, that she should secure a proper amount of rest, and when

one nurse only is in charge of a patient, the afternoon will usually be found the most convenient time for sleep if there is much night-watching to be done. Before returning to the patient, it will be advisable to take a brisk walk out of doors when the weather will permit it.

Sick-Room.—In choosing a room for the reception of a sick person, take as large an one as can conveniently be used. It is well to have it located so that the sun shines into it. Have it in a quiet part of the house, and, if possible, provided with some means for a separate fire when the weather is cold—an open grate is best. It is an advantage in severe cases to have another room adjoining for the nurse's bed, and where medicines, changes of clothing, etc., can be kept, so as to be readily at hand. If the case is one of fever, have the room cleared of all draperies and carpets, and in the place of the latter, spread on the floor, at places where a covering is desirable, pieces of carpeting that can be easily taken up and aired. Agreeable pictures, if not too numerous, are rather a relief to bare walls and, when dusted occasionally, can do no harm. Before the patient is admitted have the room dry and clean, and as long as he remains in it let it be kept as clean and dry as it is possible.

The ventilation of a sick-room requires judgment to insure that the air shall at all times be of proper temperature (65° Fahr., is right in most cases) and pure. The only way to secure pure air is to let it in from outside, and this should be done in such manner as to avoid drafts. One of the best modes of accomplishing this is to have a board, from one-half to one inch thick, six to eight inches wide, and as long as the window *sash* is wide. Raise the lower sash, place the board in under it, so as to rest on one edge and reach from side to side of the window-casing, and then shut the sash down on to it. This leaves an opening between the rails of the upper and lower sashes, and the air which enters is directed toward the ceiling, where it is mixed with the warmest portion of the air in the room before coming in contact with the patient.

When more thorough airing is demanded, the patient may, in the meantime, be taken into an adjoining room, or, if that is not feasible, cover him up snugly in bed, open the doors and windows, air the room quickly, close them again, and when the temperature is raised sufficiently, uncover the patient.

Much can be accomplished in the way of keeping the air pure, by removing all discharges, soiled clothing and dressings as rapidly as possible.

Thermometer.—All sick-rooms should be provided with a good thermometer, hung out of the way of accidents, and not against a warm chimney-flue.

Flowers in the sick-room, so long as they are fresh and growing, are by no means objectionable. The idea that they exert an unhealthy influence at night, has no foundation in fact, while, on the other hand, those which have a decided perfume, give off ozone under the influence of sunlight, and thus serve to destroy the organic matter floating in the air of the room. Faded flowers should always be excluded.

Beds.—The bedstead used for a sick person should be low and not more than three and a half feet wide. This will make it easy to lift or turn him, change the clothing, and do such other things as are necessary. It is sometimes also desirable to have two beds side by side, one of which can be used during the day, the other at night. Rest will thus be more refreshing, and the unused bedding can meanwhile be thoroughly aired.

The best bed-bottom is of woven wire, with an arrangement for tightening it when it sags from overstretching. On this a hair-

FIGURE 218.—Bedstead with woven wire bottom.

mattress may be placed, and in order that the latter may be worn evenly, and not become packed in certain places so as to form hollows, it should be made in two pieces—one square, the other oblong. Either can then be turned over and changed about, so as to present a fresh surface daily.

Feather beds should not be used about an invalid.

When a wire bed-bottom is not to be had, and other arrangements must be made use of, the essential thing is to have a smooth, level surface, that is soft and yielding, but which does not allow the patient to settle into a hollow. Except in cases of fever, and in certain injuries that require a firm, level bed, it may sometimes

be better to allow the invalid to use the bed he has become accustomed to, especially when the illness is not likely to be prolonged, and the bed is not positively a bad one.

A valance, or anything else that interferes with a free circulation of air under or about a bed, should be removed.

In a case of prolonged illness, the mattress should be protected

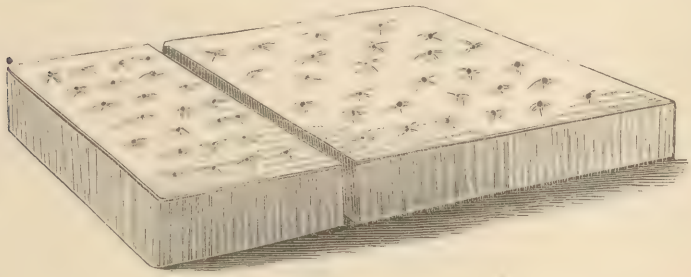


FIGURE 219.—Mattress made in two portions.

from becoming soiled, or from the odor which comes from the patient, by covering it with a square of India-rubber cloth. A small blanket folded once may be placed between this and the sheet, to avoid the uncomfortable feel of the rubber. When a sheet of rubber cannot be had, a folded blanket or quilt may be used, but it should be changed daily and aired or washed, and none but a *clean* one should be allowed to remain.

When there is a liability to escape of matter from the bowel or bladder, without the invalid being conscious of it, a draw-sheet may be placed under the hips—that is, a sheet folded several times, so as to absorb the discharges before they reach the lower sheet. This may be slipped out when necessary, and another put in its place. It is also a practice in some cases to apply a pad of oakum to the bowel, and hold it in place with a diaper, but this increases very greatly the liability to bed-sores, and requires quite as much attention to avoid this accident as does the use of a draw-sheet.

Woollen blankets are the best coverings, and coverlids and down quilts should be dispensed with.

Cotton-sheets are better than linen, and a fresh sheet should be put on the bed every day, if possible. When the supply of bedding is scanty, a change of sheets can be used, so long as they are not soiled, by airing one set out of doors or in an adjoining room while the others are in use. Soiled sheets should be removed and washed as soon as possible.

Water-beds are of great service in preventing bed-sores in patients who are unable, from weakness, to change their position,

since pressure is thereby distributed over the entire surface of the body in contact with the bed. They are made of various sizes, and the largest are quite expensive. They require to be carefully protected from oil or grease of any kind, as this renders them sticky, and so soft as to tear with the greatest ease. They should be supported by a strong bedstead provided with a board bottom, and should be covered with two folds of a woollen blanket or a quilt. A small bed, of the length of the body, will answer in most cases, pillows or folded blankets being used to cover the remainder of the bed-floor. If they contain water alone, the beating of the heart and other movements of the body are apt to create a wavy motion of the contents, which disturbs rest. This may be prevented by filling them partly with water, and then blowing in enough of air to put the rubber moderately on the stretch.

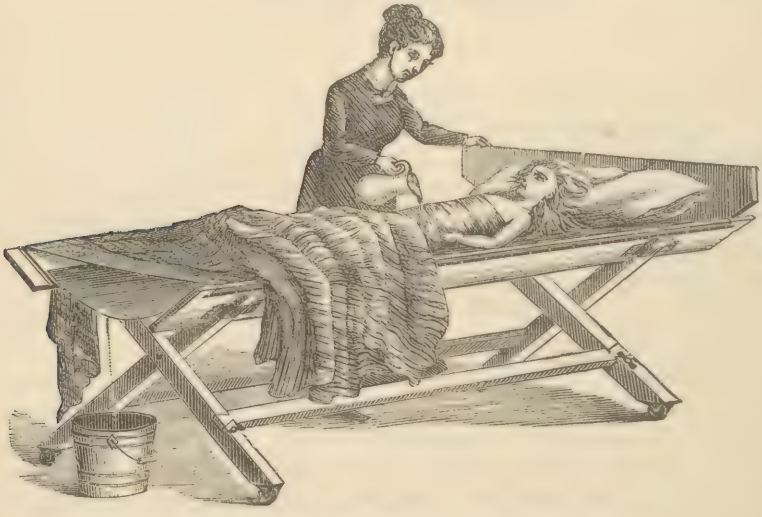


FIGURE 220.—Dr. Kibbe's fever-cot, with foot-board removed.

Occasionally, it is desirable, in the treatment of cases of high fever, to bathe the patient freely with cold or tepid water. For this purpose, nothing lessens the labor of doing so as much as the cot invented by Dr. Kibbe. The bottom of the cot is made of coarsely woven cloth of cotton twine, and below it is placed a false bottom of India-rubber cloth, sloping toward the foot. When occasion demands, water of the proper temperature can be poured over the patient, and thence it runs through into the false bottom, which conducts it to a bucket placed at the foot of the cot. Indeed, when a proper mattress is not obtainable, the ordinary cot is

to be preferred to most other beds, and this may be readily converted into a "Kibbe cot" by making a few small holes in its canvas bottom, and adding the false bottom of rubber cloth.

For treating sick persons on ship-board, where the motion of the vessel keeps the invalid in more or less constant motion, owing to his inability to hold himself steady in his berth, and when the cramped attitude of the body in the ordinary hammock interferes with rest, a hospital cot may be constructed of canvas, in the shape of an oblong box, laced at the corners and provided with a frame-work of wood to keep the sides and ends stretched to their proper form. This frame-work must be the exact size of the bottom of the cot, and be held in place by means of a false bottom made of two strips of canvas, which are laced together by their adjoining edges, after the frame has been placed on the bottom proper. The end-pieces of the cot are made higher than the sides, and terminate in a point, where eyelet-holes are formed for the reception of the two cords with which the cot is slung.

Bed-sores come from long-continued lying in one position; excoriation of the skin by matter from the bowel and bladder; the presence in the bed of crumbs, plaster-of-Paris, salt, etc., and general want of care and cleanliness. The amount of pressure needed is not very great so long as it is continuous. It makes little difference whether a person be thin or fat, as this serious condition is liable to occur in either case during a long illness in which proper care has not been taken. It is not safe to wait until the patient complains of discomfort, since it will probably then be too late, but the back, hips, heels, shoulders, and elbows, should often be examined for evidences of redness, a raw appearance, or creases made by wrinkled clothing; and the bed should always be kept scrupulously clean, aired, and smooth.

When there is any evidence of redness, such an air-cushion as is shown in the illustration on page 851 should be so placed as to relieve the prominent part; or a cushion can be made by stuffing a ring of soft muslin with cotton, tow, or curled hair. The rubber air-cushion is preferable, however, owing to the greater ease with which it can be kept clean. Conjoined with relief from pressure it is useful to apply mildly stimulating washes, such as one part of alcohol to three or four parts of water. With this the part which threatens to ulcerate may be bathed frequently during the day, and will serve to increase the flow of blood, and thus avoid death of the skin.

Before an ulcer forms, the skin becomes pale and often sodden with fluid, and instead of being inflamed it shows a want of vitality. When an ulcer has actually formed, it is absolutely neces-

sary to support the body so that no pressure can come upon this part, and such an apparatus as here shown is sometimes resorted to. It may be useful, likewise, as a temporary rest in the absence of a water-bed. The formation of a bed-sore is, however, quite unlikely when care has been taken in season to prevent it.

It is sometimes customary to apply a piece of adhesive plaster over the place where a bed-sore is threatened. This usually serves

FIGURE 221.—Arrangement for supporting a patient so as to prevent pressure on a bed-sore.

to hasten its formation, and to prevent any observation of what is going on. When a bed-sore is established, make sure that no pressure whatever comes upon it. Apply a poultice made by mixing flax-seed meal with yeast; or of equal parts of bread-crumb (wet with hot water), linseed meal, and charcoal powder. This may be dusted over with powdered charcoal before it is applied, and should be changed frequently. It will also be necessary to increase in every way the strength of the patient.

Clothing.—The best clothing for most invalids is an ordinary night-gown over a thin merino undershirt. In the case of patients who are able to be propped up in bed, a light dressing-sack may be added, and sometimes it is well, for the sake of extra warmth, that this should be made of wool.

Patients who have a feeble circulation, with cold extremities, are often rendered more comfortable by wearing a long flannel bed-gown. When this is used, however, it should be shaken and aired for several hours daily, being, meanwhile, replaced by another. Underclothing should be changed, likewise, every twenty-four hours, if possible, and to accomplish this with little effort on the part of the patient, the under-vest may be opened entirely down the front and fastened with tapes or ribbons.

In cases of fracture or other injuries of the upper extremities, the bed-gown may be made to open on one side of the body, and

down the inside of the sleeve on the same side, instead of in front, so that it can be slipped on and off without trouble. By a little skill it can be made so as to be turned either side out, and thus fasten on either the left or right side.

Restless children often require close watching at night to prevent their becoming uncovered and chilled. When their unrest is the result of fever, and the room is properly warmed, no harm is likely to result; but this can be entirely avoided by dressing them in a gown made with the waist and drawers connected, and having the legs of the latter long and closed at the bottoms.

Undressing an injured person often requires some tact in order to avoid doing further injury.

In cases of injury of the foot or leg, the boot should be removed by ripping one of the side seams. Laced shoes should have the lacing entirely removed. Congress-gaiters may have the elastics cut. Pantaloons should be carefully ripped through the outer seam, from waistband to bottom, on the side injured. A coat may be ripped through the shoulder-seam of the injured side, and the sleeve detached at the arm-hole. There is seldom occasion for mutilating garments so that they cannot be resewed, and the expenditure of a few minutes of time in this manner, will be well compensated by the avoidance of unnecessary injury from rough handling. Many fractures may be converted from a simple to a compound one—that is when the broken fragments perforate the skin—by a little mismanagement in removing clothing.

Appliances.

Certain articles are almost indispensable in the care of the sick, and there are many others that can add greatly to their comfort and lessen the labor of nursing.

Bed-pans are essential when a patient is unable, for any reason, to rise. They should be made of earthenware, and before being placed in the bed should be warmed by allowing hot water to run into them, after which the outside should be wiped dry. A warm towel should be folded over the edge of the pan to catch any moisture, and when there is difficulty in evacuating the bowel, owing to the unnatural position, the shoulders should be well raised upon pillows, the knees drawn up, and something should be placed on the bed against which the feet may be pressed.

Sickness may occur under circumstances when it is not possible to obtain a bed-pan, or, in cases of fracture of a lower extremity, it may not be possible to use one. In such cases an arrangement such as is described on page 684, of Vol. I., can easily be made, and will be found extremely useful.

Urinals may be of either glass or earthenware. The former are most easily kept clean but are most liable to be broken. Before using them they should be dipped into warm water and wiped

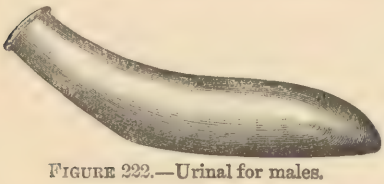


FIGURE 222.—Urinal for males.

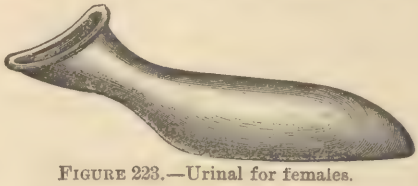


FIGURE 223.—Urinal for females.

dry. Either urinal or bed-pan should be immediately emptied and washed after use, and kept in a convenient place out of the room. Never leave a patient resting for any length of time on a bed-pan, and, except by a doctor's orders, never leave a urinal constantly in the bed.

When it is desirable to preserve the evacuations for the doctor's inspection, the vessel should be covered and placed out of doors.

Never allow an invalid to sit upon a chamber-vessel that is not strong, or that is in the least cracked. Terrible wounds of the buttocks have not infrequently resulted from the sudden breaking of a chamber while in use.

Back-rest.—When patients are able to be propped up in bed to take their meals or to change their position, a back-rest made so that it can be fixed at any angle, will be found very serviceable, and especially when provided with arm-rests; but, in the absence of such a contrivance, a flat-backed chair can be reversed so as to rest on its forward edge and top of the back, and pillows can be adjusted against the inclined surface so as to support the back and shoulders.

Support for Bedding.—When the weight of bed-clothing is objectionable—as during inflammation of the bowels and in some

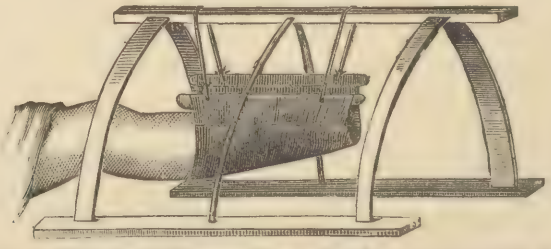


FIGURE 224.—Convenient mode of suspending a leg after an amputation of a foot or ankle. The same arrangement will serve to prevent contact of the bedding with a tender limb or with the belly.

surgical affections—two halves of a barrel-hoop can be wrapped with strips of flannel and tied together so as to cross each other

at right angles. These may then be placed astride the body or limb to be protected. When the presence of such an apparatus in bed is irksome, a smooth stick can be placed under the clothing, and two stout dress-holders, suspended by cords from the ceiling, can be made to grasp its ends together with the clothing which covers it.

Cushions.—In addition to the feather pillows ordinarily used, air-cushions of India-rubber and cotton-drilling, or small pillows

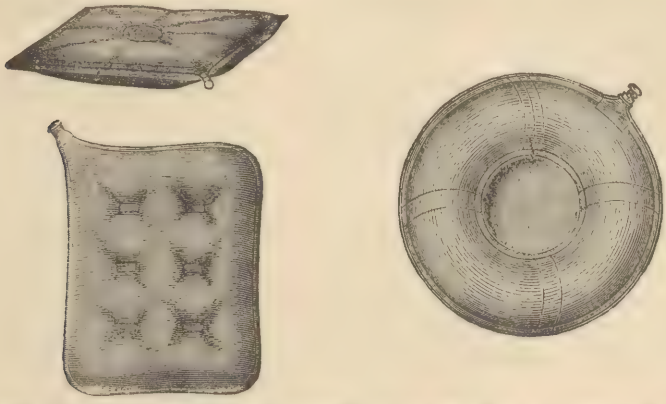


FIGURE 225.—Varieties of air and water pillows. The round one is adapted to be used also as a bed-pan when the ring is inflated, but should be so used only when travelling or in emergencies when an earthenware pan is not available.

of various sizes stuffed firmly with curled hair, will prove serviceable as supports for various parts of the body. In warm weather the latter are far more comfortable as supports for the head than are pillows of feathers.

In fractures of limbs, long cushions of strong muslin, half-filled with sand that has been washed free from dirt and carefully dried in an oven, are often of service. Smaller cushions of the same character can be made use of to support splints, or to relieve pressure at various points.

Water- and Ice-bags and Tins.—For applying heat or cold, nothing can be more convenient than the India-rubber bags now made in various sizes, and shaped like Fig. 226. These may be filled with hot or cold water by means of the funnel-shaped mouth, and then closed with the screw-cap. In their absence, stoneware mineral-water jugs are useful, but the corks used for stopping them should be securely tied in. When these water-bags leak, as they sometimes do, about the neck, where they become broken, the holes may be covered with pieces of rubber cloth and a cement made by dissolving bits of gutta-percha, or pure India-rubber, in chloroform, until it is syrupy. A can made

of tin, in the shape of Fig. 227, may be constructed by any tinsmith, and is particularly useful for applying heat to the belly.

FIGURE 226.—Water-bag.

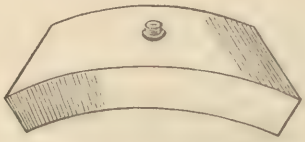


FIGURE 227.—A tin vessel for applying heat to the belly.

Invalid-Lifts.—With the aid of a strong cord or a strip of webbing attached to the foot-posts or rail of a bedstead, or to a ring in the ceiling, an invalid can with greater ease help himself to a sitting posture, or turn from side to side. Such a contrivance as shown in Fig. 228 may be of service. Its centre is made of cro-

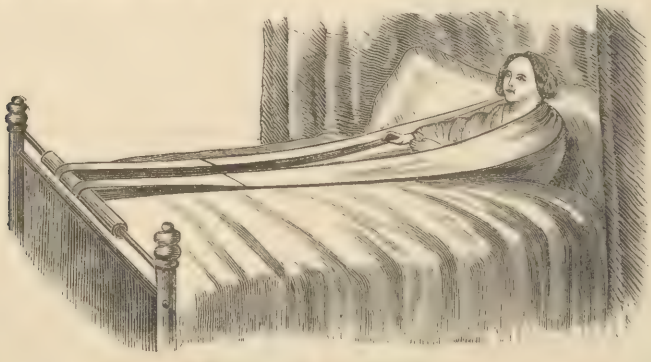


FIGURE 228.—Invalid-lift.

cheted worsted, and the ends are attached to long strips of webbing which pass around the foot-rail, and return, so as to be grasped by the hands of the patient. A support made of elastic webbing and a cross-bar, in the form shown in Fig. 229, is of service to those who suffer with difficult breathing, due to asthma, heart disease, dropsy, etc.

Invalid Chairs.—For carrying an invalid about the house, a chair such as shown in Fig. 230 will be a great convenience, but the methods referred to in the Chapter on Accidents and Emergencies, will serve when such removals are not often demanded. With the exception of carrying up or down stairs, nothing is bet-

ter adapted for the moving about of an invalid than the wheeled chairs, such as are shown in Figs. 231 and 232, made by the New

FIGURE 229.—Sling for patients who suffer with difficult breathing.

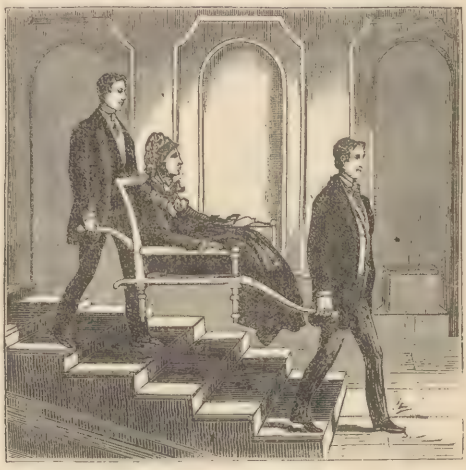
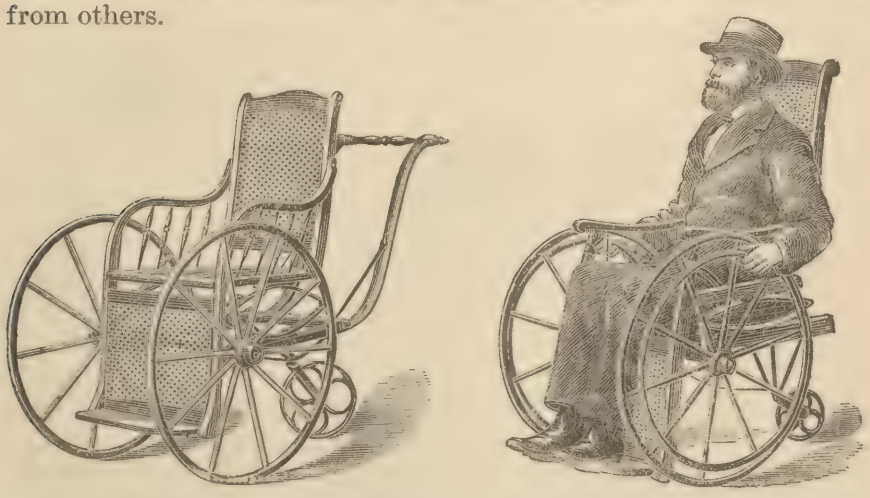


FIGURE 230.—Chair with handles, for carrying an invalid.

Haven (Conn.) Folding Chair Company. Their use enables many convalescents and cripples to dispense largely with assistance from others.



FIGURES 231 and 232.—Wheel-chairs for invalids. The first is intended to be pushed from behind, and is best adapted for convalescents who are too feeble to roll themselves; the second is propelled by means of the circles of wood attached to the spokes of the wheels. Either will easily pass through an ordinary doorway.

Night-Chair.—The use of a night-chair adds to the comfort of invalids who are able to leave their beds, but unless they are carefully aired after use they are apt to become nuisances. They should be made with arms that can be removed, so that there may be none on the side next the bed, or they may be without arms, but provided with a low back on two adjoining sides of the chair. When it does not require too much exertion, it is better to place the patient in a wheel-chair, and so roll him, carefully wrapped in a blanket, to the cabinet.

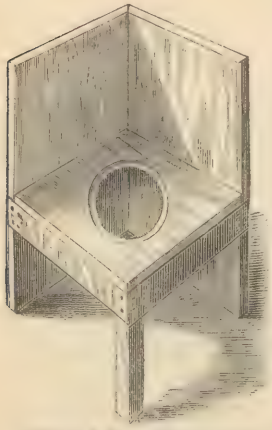
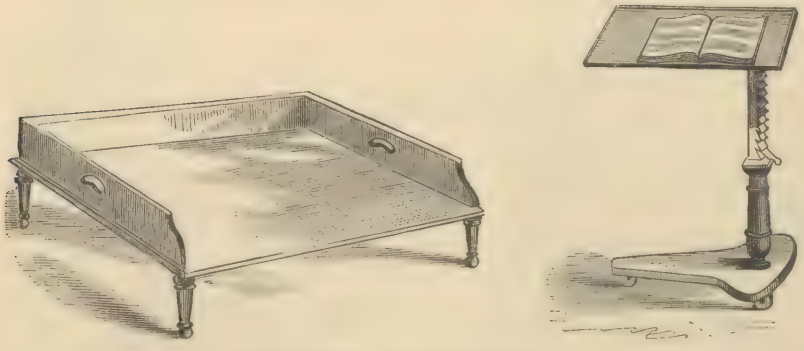


FIGURE 233.—Frame-work of a night-chair of simple construction, without arms. This may be covered with calico, with a valance to inclose the lower part and a cushion made on a false bottom of wood to cover the seat when not in use.

Bed-tables.—When an invalid becomes sufficiently strong to feed himself, or to read, it is of service to have a table made with short legs, that will rest on the bed, or one in the form of Fig. 235, which is supported by a column that will adapt it to various heights.

Mosquito netting is generally objectionable, on account of its liability to interfere with a free supply of air. During convalescence, however, when the constant presence of a nurse is not necessary, the use of netting as a protection against the annoyance of flies may enable



FIGURES 234. and 235—Bed-tables.

the patient to prolong the morning nap which is usually so refreshing. Whenever a netting is used, it should be taken down during the daytime, and thoroughly aired out of doors, or in another room.

Bandages.—Theoretically, there are many varieties of bandage, but the roller—a long strip of muslin or flannel, formed closely into a cylinder—is the only one much used, and with skilful management it can be made of great service in many cases.

Roller-bandages are made of loose-textured muslin or flannel *torn* lengthwise with the cloth, and vary in size from an inch to four or five inches in width, to as many or more yards in length.

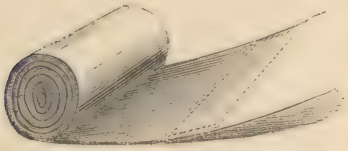


FIGURE 236.—A roller-bandage, showing the method of uniting its pieces.

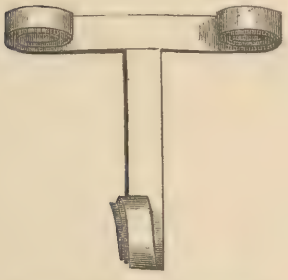


FIGURE 237.—A T-bandage.

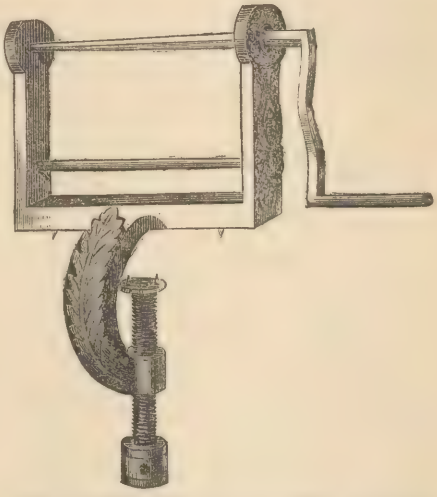


FIGURE 238.—Machine for rolling bandages, to be fastened to the edge of a shelf or table. When the bandage is rolled it is held while the spindle is turned backward two or three times to loosen it and then drawn out.

The ordinary size is two and a half inches in width and five or six yards in length. The edges should be without selvage or hem, so that the bandage may stretch evenly, and when additional lengths are added, the adjoining ends should be overlapped about half to three-fourths of an inch, and sewed through and through all around. Similar bandages may be made of India-rubber, when it is necessary to exert pressure or to confine the perspiration to the part covered.

To roll a bandage snugly, a machine is useful, but when there are but few to be prepared, it may be done as follows : Take one end of the strip a few inches above the right knee, allowing the remainder to rest on the floor in front of the foot. Fold and refold the end, so as to make a small compact roll, and then place the palm of the right hand on it and roll it toward the knee, the left hand being used meanwhile to keep the bandage tightly drawn. Draw up the roll again on to the front of the thigh, and repeat the

manœuvre, and so on until the whole is firmly rolled. The edges should be kept true and even, and when the whole has been rolled the loose threads may be pulled off. Sew or pin the free end to keep it in place. Another mode of rolling a bandage is shown in the adjoining figure; but although more elegant, it requires dexterity, and does not lead to any better results.

A T-bandage, as its name suggests, is made by sewing one end of a strip of bandage to the edge of another one, so that they will be at right angles. This is commonly used to retain dressings on the groin, on the lower end of the back, or between the thighs.

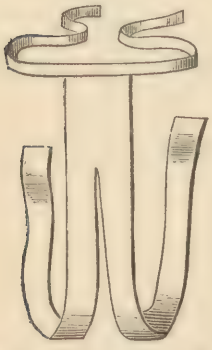


FIGURE 239.—Double-tailed T-bandage.

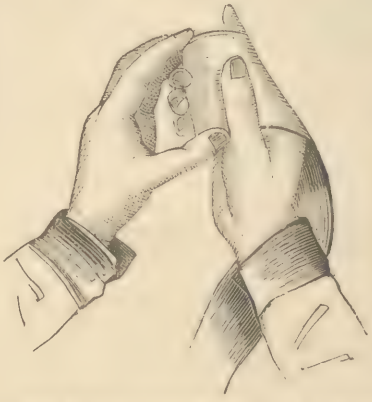


FIGURE 240.—Manner of rolling a bandage with the hands.

The horizontal portion is first fastened about the waist, and the other end, being carried between the thighs, is fastened to the first portion in front or behind, as the case may be.

Plaster-rollers are made of the loosest textured muslin, crinoline, or cheese-cloth. They are usually not more than two inches wide, as they can then be better applied without "reverses." In making them, a shallow dish, like the top of a long envelope box, a quantity of fine, recently prepared plaster-of-Paris, and a large spoon are to be provided. Laying one end of the bandage lengthwise in the box, a few spoonfuls of plaster are put on it, and scraped back and forth until the meshes of the cloth are filled. All superfluous plaster having been scraped off, the end is rolled up, with care not to shake out the plaster in its meshes, a fresh portion of bandage is drawn along into the box and similarly treated, and so on until the whole is rolled.

Plaster-rollers should not be made very firm, as they require to be immersed in water for a few moments before being used, and firm rolling interferes with wetting the plaster in their folds. When

they are not needed for immediate use, they should be wrapped in tin-foil or waxed paper, or placed in a fruit-jar with a tight-fitting cap, to exclude moisture which prevents the plaster setting when they are used.

Starch-bandage is made by applying thin, boiled starch as a roller-bandage is put on. Previous to putting on the bandage the

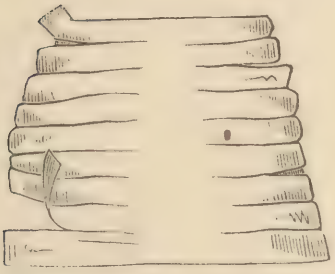


FIGURE 241.—Many-tailed bandage made from a single piece of muslin.

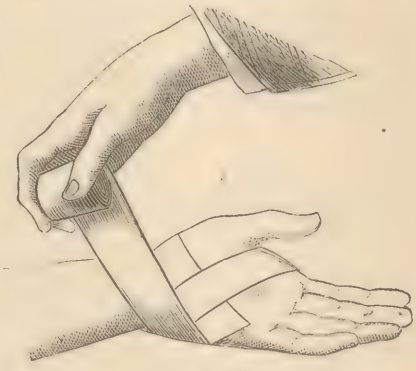


FIGURE 242.

limb must be enveloped in a thick layer of soft cotton-wadding, with which, also, all hollows in the surface must be evenly filled. The limb needs to be kept at rest for several hours afterward, and the drying of the starch may be hastened by placing bags of hot sand about the limb, or ironing it with a moderately hot smoothing-iron.

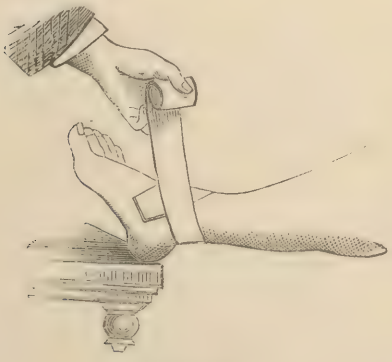


FIGURE 243.

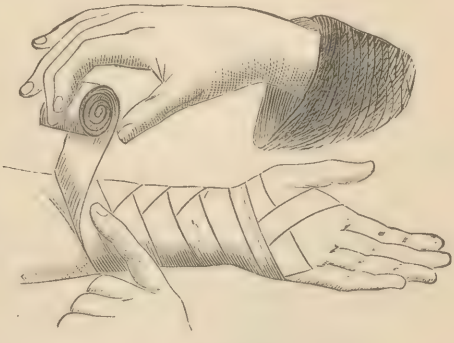


FIGURE 244.

A many-tailed bandage is made by overlapping half an inch the edges of a number of short strips of two-inch bandage, and then sewing a similar strip at right angles down their middle, to keep them in place. Another mode is to tear a square of muslin into the shape shown in the above figure.

This is used when it is not desirable to disturb an injured limb in order to remove the dressing, and is applied by commencing at the end farthest from the body, and laying, alternately, the strips of both sides smoothly into place across the front of the limb. As the ends are overlapped by this method, the dressing is rendered firm. The bandage is more smoothly applied if it be first wet with water.

In applying a bandage to the arm, thigh, or leg, it is usually necessary to begin with the hand or foot in order to prevent their becoming swollen with blood as a result of the pressure of the bandage above. Commence the turns as shown in the adjoining illustrations, and after fixing the extremity of the roller, make a few turns about the foot or hand, as shown in Fig. 242, and then carry the turns of the bandage upward on to the limb, allowing each turn to cover about half of the turn preceding it, *taking care that each edge of the bandage is drawn equally tight.* When the calf of the leg or the tapering part of the fore-arm are reached, it will be found that the edges of the bandage cannot be kept evenly strained when it is applied so as to overlap the turn below, the lower edge being loose, as shown in Fig. 248. To avoid this and to cover the limb evenly, reverse the bandage at each turn as shown in Fig. 244. The turn just made must be held with the tip of a finger or thumb; the tension on the bandage is then to be relaxed and the roller turned over. On drawing the bandage tight again, its surface will adjust itself smoothly.

FIGURE 245.—Bandage for a foot and leg.

FIGURE 246.—Mode of bandaging the large joint of a thumb.

FIGURE 247.—Arrangement of a roller bandage for a finger.

It is only by practice that skill can be acquired in applying the roller-bandage. The adjoining figures will, however, show the appearance of a bandage when properly applied to certain localities.

When the end of an amputated limb is to be covered, a piece of lint shaped like Fig. 249 is sometimes applied; the ends being smoothly folded over each other, are retained in place by a few turns of a roller-bandage.

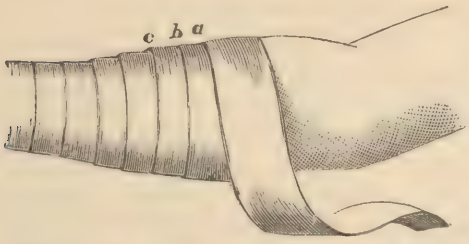


FIGURE 248. A fore-arm that is not properly bandaged. At *a*, *b*, and *c*, the lower edge of the turns are looser than the upper edge, causing the pressure to be uneven and enabling the bandage to slip downward.

Sticking-Plaster is of various kinds. That made with resin, oil, and litharge, needs to be heated over the flame of an alcohol lamp (to avoid smoking it), or by applying its back to a can of hot water, hot stove-pipe, the glass chimney of a kerosene lamp, or to a hot-air register. The practice of using turpentine to soften it is wrong, since it is apt to cause inflammation of the skin.

Adhesive plasters are now made with India-rubber as an ingredient, and are so adhesive as to require no heating. When either of these plasters is applied, the skin must first be perfectly dry to insure their adhesion.

Isinglass plaster is made to adhere by moistening it. To do this, a damp sponge may be brushed *once* only across its adhesive surface.

For small cuts and for covering small, tender surfaces, "goldbeater's skin" or the prepared intestine of cattle is serviceable. In applying it, the skin and not the plaster must be wet, since the latter is apt to curl up and become unmanageable when it is dampened.

When adhesive strips are to be removed, pull them from the ends *toward* the sore or cut, and before reapplying them, clean the skin by softening any remaining plaster with turpentine. This must afterward be entirely removed with hot soap-suds to prevent its inflaming the skin.

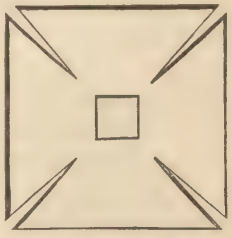


FIGURE 249.—Maltese cross, such as is formed of a sheet of lint for covering the end of a stump after amputation. The central hole should be smaller in proportion than is here shown.

When the ordinary sticking-plaster is in contact with discharging sores, it often becomes blackened. This need cause no alarm, as it is only the effect of the discharges upon the litharge with which the plaster is made, and is no indication of "mortification."

One of the modes of treating ulcers of the leg is by the use of

strips of sticking-plaster, which prevents the edges of the sore being pulled apart by the elasticity of the skin adjoining. To insure this effect the plaster should not encircle the limb, but should extend only far enough to hold on the skin. The manner of arranging them most effectually is shown in the adjoining figure, in which the ulcer has been but partly covered.

FIGURE 250. — Mode of applying strips of sticking-plaster to an ulcer of the leg.

Leeches.—The head of a leech is at the smaller extremity. When not wanted for immediate use they may be kept in a small bottle, over the mouth of which a piece of paper or cloth has been securely tied, and, in the case of the former, pierced with a few holes. Before applying them the surface of the skin should be washed with warm water, to which a little baking-soda has been added, in order to remove entirely the fatty matter on the skin (the presence of which will generally prevent a leech from taking hold) after which the skin should be dried. It is well to put each leech into water, and then to wipe it dry with a soft napkin in order to remove the slime covering its skin. All the leeches to be applied to the part should be placed in a glass of proper size, which may be covered with paper, and the whole can then be inverted and placed in position. The paper can then be withdrawn. Leeches cannot bite upon surfaces covered with hairs.

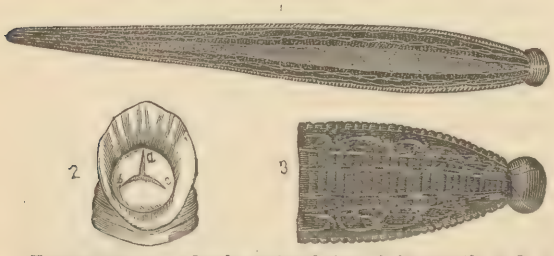


FIGURE 251.—1, a leech—natural size; 2, its mouth, *a*, *b*, *c*, its jaws; 3, the markings on the surface of its hinder extremity.

When a leech is to be applied within the mouth, or it is desired to make it bite at any particular point, it may be inclosed in a test-tube, or in a leech-tube made for the purpose. A vial with a narrow neck will serve quite as well. A large tube should be chosen, so that there may be room for the leech to fill itself with blood.

Never pull off a leech, but when it fails to let go, put a few grains of salt on it and it will then drop off. After leeches loosen their hold they should be put into a basin of water. It will be

some time before they can be induced to bite again, and when salt is used to make them drop off, they are usually never good for much afterward.

To stop the bleeding from leech-bites, put a pad of lint or bits of muslin over the bite and make pressure for a few minutes with a finger. If this does not suffice, put on a pinch of powdered alum and again apply a pad as before.

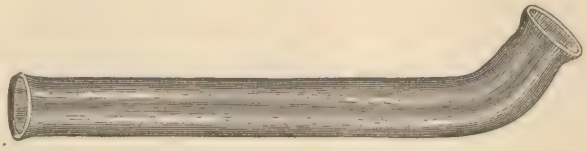


FIGURE 252.—A glass leech-tube.

When it is desired to prolong the flow of blood, cupping may be used, or a warm poultice may be applied to the bites. The condition of affairs should be examined occasionally, to make sure that too much blood is not being lost, and this is especially necessary in the case of infants and children.

Cups of glass and tin are made purposely for cupping, but small tumblers will answer. To use them, take a bit of blotting-paper or cotton-wool, wet it with alcohol, place it in the glass and light it. Then, after a moment, turn the glass quickly over and apply its mouth to the skin. The flame, having exhausted the air in the cup, will almost immediately go out, and the skin under the cup will rise up and become red. When the cup has remained from five to thirty minutes—as need may be—it can be loosened by inserting a thumb-nail under its edge, so as to admit air. *Wet cupping* consists in pricking with the point of a lancet the raised surface from which a cup has been taken, and reapplying the cup again, whereby a little blood is drawn.

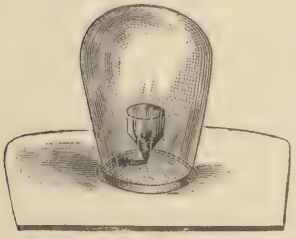


FIGURE 253.—A cupping-glass applied, showing the twisted paper-cone wet with alcohol, and the surface of the skin underneath, rising up into the cup.

Poultices.—These should be large enough to reach some distance about the part which is the seat of pain or inflammation, and at least a half to one inch thick at the edges as well as at the centre. An exception to the foregoing is the poultice of mustard flour. This should be spread evenly, but thinly, and should be no larger than the surface which it is desired to irritate. Always have a poultice as light as possible, and as hot as can be borne by the cheek or inside of an elbow of the person who makes it.

To make a poultice, have ready a piece of muslin, somewhat larger than the poultice is to be; a piece of mosquito-netting, or

similar coarse lace ; a good-sized bowl in which to mix the poultice ; a knife to stir and spread it with ; some vaseline, cosmoline, or suet, to grease its surface with (especially when it is to be applied to a part which has hair) ; a quantity of *boiling* hot water, and whatever is to form the basis of the poultice.

If linseed meal is to be used (this makes the best of all poultices), put rather more than will be needed into the bowl, and pour in little by little the boiling water, stirring it meanwhile with the knife or spoon. Mix thoroughly, and do not have it too stiff, nor so soft that it will not keep its place when applied. Have the muslin spread on a wooden table or a board (not on the cold marble top of a dressing-stand) and put the greater part of the poultice mass into its middle, working it quickly out into the shape it is to have when finished. Add (quickly) any that may be needed to make the poultice evenly thick all over ; lay on the lace ; fold the edges of the muslin over the margins, so that the poultice will not ooze out ; spread on a little of the vaseline, or whatever is used to grease the surface ; double the entire poultice in half, so that its face shall be kept moist and hot ; *slide* it off into a hot plate, cover the whole with a piece of warm flannel, and then take it to the patient, whose clothing should have been loosened at the outset. Open the poultice, try it as above directed, to see that it is not too hot, and put it lightly in place. Cover it first with oiled silk, thin rubber, or waxed paper, and then with the hot flannel in which it and the plate were wrapped, and bind the whole in place with a folded towel or strip of muslin snugly pinned, so that it cannot shift about. Then clean up the litter, and get everything ready for making another poultice when the first has become *cool*. Do not allow a cold poultice to remain on the skin.

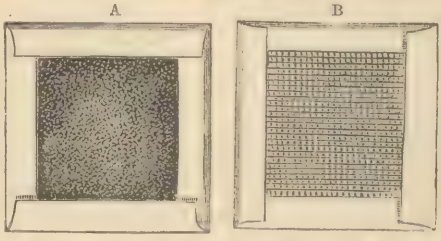


FIGURE 254.—A poultice with the cloth containing it, folded over to prevent the poultice from escaping at the edges. In B the surface of the poultice is covered with a gauze, to prevent it sticking to hairs as it dries.

When small poultices are used, such an apparatus may be used as is described in the chapter on THE EAR, for re-warming them, but after this has been done two or three times they become dry and irritating instead of soothing, and fresh ones should be made.

A very convenient mode of making a flaxseed-meal poultice, is to put the poultice-mass into a flannel bag of proper size, and fold over and sew the mouth to prevent its escape.

Syringes and Enemas.—For giving enemas two kinds of syringe are desirable. The form shown in Fig. 255 is most useful when a considerable quantity of fluid is to be thrown into the bowel or vagina, owing to the fact that the nozzle does not have to be withdrawn in order to fill the syringe, as in the case of the one shown in Fig. 256. The latter is best, however, when a small, amount of fluid is to be employed—as when medicine is given by the bowel. Both should be thoroughly washed after use, and in the case of the soft rubber bulb-syringe, soap-water should be used for this purpose when the enema consists of oily substances.

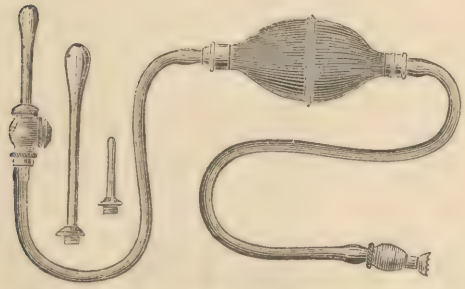


FIGURE 255.—India-rubber bulb-syringe—Davidson's pattern.

In unscrewing the tubes of the former, care should be taken not to loose the valves. The leather packing of the piston in the latter is apt to become dry and loose. This may be remedied by partly filling it with warm water and allowing it to stand for a time in water or by unscrewing the cap, withdrawing the piston, spreading and oiling the packing, and returning it carefully to the barrel, as before. Iodine and greasy substances cause soft rubber to become brittle.

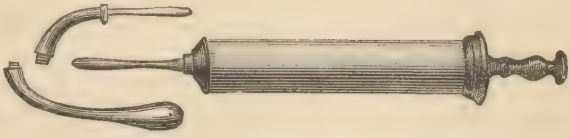


FIGURE 256.—India-rubber (hard) enema syringe.

FIGURE 257.—A rubber-bag syringe.

In inserting the nozzle of a syringe it should first be oiled and then be passed inward and backward through the opening of the bowel for an inch and a half; then direct the point slightly forward and to the left, or toward the left hip-joint. Whatever fluid is used should be about the temperature of the blood (99° to 100° Fahr.), unless otherwise ordered, and should be thrown in very slowly and gently. If the patient feels a desire to expel it before the whole amount ordered has been used, the operation may be stopped for a few moments and then resumed.

It is always advisable that the patient should lie upon the left

side with the knees drawn up, when an enema is administered; and when it is to be retained for some time, this may be aided by making firm pressure against the opening of the bowel with a warm towel. When an enema of water is to be taken to facilitate a movement of the bowels, and the water-closet is not in the house, a convenient syringe is the large India-rubber bulb, with a nozzle attached. The bulb can be filled and placed in the pocket, and thus carried without attracting attention. Such a syringe may be used as well, on other occasions, but should be carefully washed out with soap and warm water, and rinsed clean when anything besides water is used.

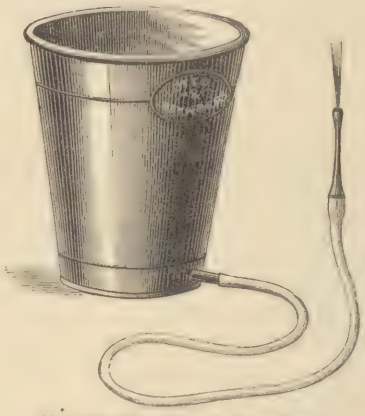


FIGURE 258.—Fountain syringe.

One of the most useful is the "Fountain Syringe." The reservoir of tin or India-rubber is filled and placed on a shelf or hung on a conveniently arranged nail or hook, and the weight of the column of fluid is sufficient to throw the enema into the bowel or vagina.

Baths.—To give a patient a full bath, slip off the body clothing and wrap him in a sheet. If he is to be taken some distance to the bath-tub, wrap about him a blanket also. The latter may be dropped off as he is placed in the tub, but the sheet may be worn while he remains in the bath. If he is weak, a hand may be kept under his head as a support during his stay in the bath. On rising from the water, wrap the blanket about him and let him drop off the sheet into the tub, or on to the floor, and, thus wrapped, carry, or take him quickly back to bed. While thus wrapped, the skin can be quickly dried by passing the hands and towel under the blanket, and the latter can then be withdrawn. Cover snugly for a few minutes, and let him rest before attempting to replace the body-clothing.

In giving a bath to sick children, it will often avoid alarming them if the bath-tub is filled and taken to the bed-side, covered with a large bath-towel or sheet. This is to be held tightly while the child is placed on it; both may then be lowered gently into the water, and the child's attention may be taken with a few wooden toys that will float about it.

A foot-bath can be given without disturbing the patient, by placing a folded sheet under the legs, and then, drawing the legs

up, place the bath on this sheet. While the feet are immersed, a blanket can be drawn over the tub and knees to prevent the steam from wetting the bed-clothing.

Hip-bath.—In giving a hip-bath to a weak patient, a tub should be used which is large enough to permit the person to sit in it. Before rising, the body-clothing should be rolled up about the chest and securely pinned, and a blanket be wrapped about the body, so as to cover the lower limbs, and open behind. This should be pinned at the neck. Then, as the patient rises, let the nurse stand behind him, and holding under the arm-pits, support his weight as he sits down in the bath. Now, throw another blanket over the shoulders and about the tub, and, if need be, sit down behind him so as to support his head and shoulders. Roll him up in the first blanket as he rises, and dry him off in bed with a towel before removing it.

Vapor-Baths.—For a simple vapor-bath, slip off the body clothing and adjust a blanket as directed for a hip-bath. Seat the patient in a wooden chair, and envelop him and the chair in a second or even a third blanket. Under the chair place a wooden or metallic dish or tub holding about a gallon of hot water, and into this slowly immerse heated bricks or hot flat-irons, so as to make a cloud of steam. Do this carefully so as not to scald the patient. After the bath has continued for the time directed by the doctor, roll the patient again in the first blanket, and allow him to remain in it for some time after returning to bed, covering him, also, with additional blankets to favor perspiration.

Moving Patients.—When a sick person is to be moved from one bed to another, and is incapable of self-help, the easiest way is for four persons to take the lower sheet by its corners gathered together, and, having the bedsteads far enough removed from the wall to pass between them and the latter, the transfer can be made with the greatest ease. When the invalid is not heavy, two persons of average strength can thus accomplish the removal by rolling the sheet up at the sides into a firm roll, and taking an end of a roll in each hand. When beds are of equal height, and can be pushed alongside of each other, the patient can readily be drawn across from one to the other by filling the gap with a blanket, and pulling him over on the bottom sheet.

In cases of injury of the upper extremities, when the patient has to be raised or lowered to or from a sitting posture with care, to avoid pain, let a person stand on either side, and pass a hand (left hand when standing on the patient's right, and vice versa) between the patient's back and the pillows, until met half way by the hand of the assistant on the opposite side; then, after hooking

the ends of the fingers together, the patient can be raised with the greatest ease, and without risk of hurting him by uneven pressure or sudden movements.

Sweeping.—When a sick room requires sweeping, it avoids dust and noise to wrap a dampened towel about the broom, and, laying it flat on the floor, push it from side to side. Large bits of litter should be picked up. When these methods are tedious or imperfect, a short-handled broom or a bristle-brush and dust-pan should be used, and the dust should be brushed at once into the pan and not swept across the floor. The absence of a carpet simplifies greatly the labor of keeping a room tidy.

Screens.—One of the handiest articles in a sick-room is a folding screen. It serves to cut off drafts of air; to shield the patient from observation when, for any reason the door of the room is open; to temper the heat of a fire; to shade the bed from strong sunlight, or to enclose a part of the room where the nurse sleeps, or where medicines, etc., are kept. One of the simplest and best contrivances for this purpose is made by covering an ordinary folding clothes-horse with calico, which is attached to it by means of tapes. This permits the covering to be removed and washed at any time.

Sick-room Cooking.—When invalids are very sick, no food should be prepared in their sight, and no cooking should be done in the room where they are. Where gas is used, a variety of burners are to be had for boiling water, etc.; but in their absence an "Etna-lamp," such as shown in the figure, will be convenient. The base of the cup is formed by a gutter in which alcohol is to be burned. The heat will be sufficient to boil water placed in the cup. This can easily be made by any tinsmith.

FIGURE 259. — An "Etna-Lamp."

Night-light.—It is sometimes desirable, in the sickness of children and others, to have a small amount of light during the night, and little kerosene lamps are now made for this purpose. No light is superior, however, to that of a gas-jet turned down to a small flame and shaded by means of tin or pasteboard from shining in the direction of the patient. Next to this, a small glass partly filled with sweet oil, in which a little wick is floated by means of a cork, is the best. Such a flame serves as a means for lighting a candle or taper, when more light is wanted, or for seeing a clock or watch-face without risking the awakening of the patient by scraping a match. A mistake is often made in keeping a sick-room too light during the hours of rest.

Champagne-tap.—A number of appliances are made, of which the adjoining figure illustrates one, whereby effervescent drinks—so often used by the sick—can be drawn in small quantities, and thus avoid wasting the greater portion of the contents of the bottle.

FIGURE 260.—One form of "Champagne-tap" which serves also as a corkscrew. The cross-piece acts as a stop-cock.

Ice may be preserved, in small lumps, for a number of hours, and in such a way as to be available for use by the patient without assistance, by taking a glass, or bowl, covering it with a piece of clean flannel, and, after pushing the latter down into the glass so as to form a pouch, holding it in place by means of an India-rubber band or a cord. Into this pouch small lumps of ice can be put, and the whole must then be covered with several layers of flannel. In such a pocket, ice will keep, without melting, for a long time. When water has accumulated in the glass, so as to reach to the pouch, it must be poured off.

FIGURE 261.—A glass arranged for holding ice.

To divide a lump of ice, notice the direction of the grain and then press the point of a large-headed shawl-pin steadily in that direction at the place where it is desired to separate it. In this way, with no noise or waste, and with little labor, a large cake may be easily split. To break ice into small fragments, enclose the lump to be broken in a coarse towel, and either pound it with a heavy object or strike it against a hearth or the marble top of a wash-stand. This will quickly mash it into fine pieces and avoid scattering it about.

Catheters should always be thoroughly washed after they have been used, by letting water run through them. Care should be taken that there are no plugs of mucus or blood in the side-openings near the point. When they are to be used they should first be warmed and then greased with a finger dipped in oil, and not by dipping the catheter itself in oil, as this allows oil to enter it, and renders the urine greasy, so that it cannot afterward be examined if desirable to do so. When a catheter is being withdrawn, cover the outer opening with the end of a finger. This prevents the entrance of air, or the dripping of urine from the lower end, and the wetting of the bed. A very convenient arrangement is the attachment of small India-rubber tubing to the catheter, so as to extend outside the bed-clothing and prevent all risk of wetting them or necessity of placing a vessel in the bed.

Do not attempt to bend the ordinary yellow elastic catheters without warming them, and *never* use a catheter the tip of which is at all cracked or broken. It is always well to have a new catheter for every patient.

Rubbing.—Among the accomplishments of a good nurse is the knowledge of how to rub a patient so as to relieve pain, dissipate swelling, increase the circulation of blood in paralyzed or cold limbs, loosen stiff joints, and exercise the muscles of the body generally. The art of doing this cannot well be conveyed in print, but must be learned by practice. A general description of the methods is given, however, in Vol. I., in the chapter on THERAPEUTICS.

Sponges are dangerous things to use about open wounds. For operations, where they are indispensable, they should always be new, and unless they have already been prepared, they should first be pounded to break up the chalky lumps which they often contain, and to dislodge the sand; then wash them thoroughly under a small stream of water and dry them. For cleaning sores, a stream of warm water to which carbolic acid has been added (a teaspoonful to two quarts of water), aided by small bunches of oakum or cotton-wool, are the best, as the latter can at once be destroyed. Sponges are apt to contain blood and matter in their interior, even after the most careful washing, and these, by putrefying, convey poisonous matter to a wound when next used.

Sponges used for the skin should occasionally be washed with a solution of ten grains of permanganate of potassium in a quart of hot water, rinsed in clean water, and hung by a string to dry in out-door air.

Compresses are pads of cotton, tow, oakum, lint, or folded fabric, of various shapes, and adapted, in thickness, to the varying

surface of the part to which they are to be applied as a means for exerting pressure.

Laced Stockings.—When it is desirable, as in cases of enlarged veins of the leg, to apply pressure for a considerable time, elastic bandages, made after careful measurements, are most ser-

FIG. 262.

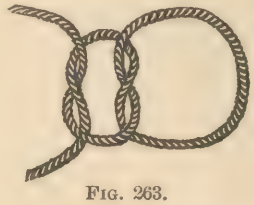


FIG. 263.

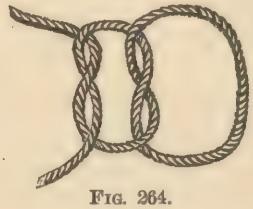


FIG. 264.

FIGURE 262.—Laced stocking for supporting enlarged veins of the leg.
FIGURE 263.—A "reef-knot" properly tied.
FIGURE 264.—The "granny-knot," or a square knot improperly tied.

viceable. Very good results, however, can be had from bandages made of flannel in the shape desired, and lacing them at the side in the manner shown in the adjoining figure.

Knots.—Occasionally it is necessary to assist a surgeon in tying a blood-vessel, and it will be well to know how to tie a square knot properly so that it will not slip. For this purpose the reef-knot and not the "granny-knot" should be made. In the former it will be seen that both ends of the thread pass over and under their respective loops, whereas in the "granny-knot," the ends pass over and under alternately.

Nausea, which almost always follows the inhalation of ether or chloroform, often continues for a number of hours, and may cause repeated vomiting. It may sometimes be controlled by swallowing small lumps of ice; by doses of a drop of tincture of ipecac in a teaspoonful of water, at intervals of ten or fifteen minutes; by a dose of twenty to thirty grains of bromide of potassium; by a mustard poultice to the stomach; or by taking a few mouthfuls of solid food. Iced cream which has not a very decided flavor, sometimes controls it nicely. So does boiled corn-starch with a little cream.

Medicine Measures.—These are far better than spoons, owing to their greater accuracy. Even when the medicine has to be given with a spoon, it is better to measure it with a properly gradu-

FIG. 265.—Medicine glass.

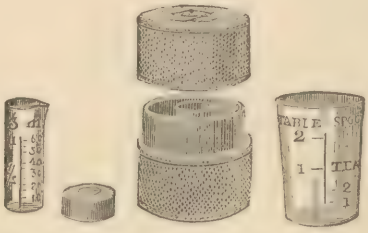


FIG. 266.—Medicine glasses fitted to a morocco case.

ated glass. For small quantities a minim glass is necessary, while a two-ounce glass, graduated for drachms and ounces, will usually serve all other purposes.

When spoons are used it is the custom to estimate that:

One teaspoonful equals..... 1 drachm.
One dessertspoonful equals..... 2 drachms.
One tablespoonful equals..... ½ ounce.

Dropping Medicine.—Although it is always desirable to measure fluid medicines in a glass made for the purpose, especially in the case of such strong ones as are given in drops, it may sometimes be necessary to depend upon a less accurate method. A simple dropper that answers every purpose may be made of a little strip of soft, unglazed paper—like filter-paper, or even the clean edge of a newspaper. This may be about one-eighth of an inch wide and a couple of inches in length. Bend it to a right angle at its centre, and put one end into the neck of the vial. On tipping the vial the drops will run steadily from the outer end of the strip.

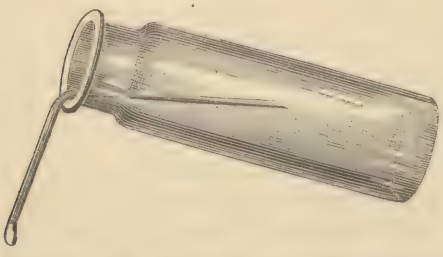


FIGURE 267.—Contrivance for dropping medicine.

Pills.—The reason for the difficulty which some persons meet

with in swallowing pills, lies in the fact that the pill is too small to be grasped by the upper part of the throat; by sticking to the side of the passage, it excites ineffectual efforts at swallowing, and these are followed by retching. All this will be avoided by enclosing the pill in some soft material, so as to form a mass like that of a morsel of food; no trouble will then be experienced with it.

Powders.—Unless they are of such disagreeable taste that they require to be mixed with something that will disguise it, powders can ordinarily be taken best by pouring them from a folded paper into the back of the throat, and then rinsing them down with cold water. In the case of bulky powders this may be troublesome, unless two or more portions be made of them. When the taste is disagreeable—as in the case of quinine—they may be wrapped in thin tissue-paper, or a wafer of rice-flour and milk—such as may be obtained of a druggist—or they may be enclosed in capsules of the same material, shaped like small watch-crystals, and cemented at their edges (also to be had of many druggists), or in jujube-paste capsules, like those shown in the adjoining figure. When a wafer is employed it may be managed as follows:

FIGURE 268.—Medicine capsules of jujube-paste.

Take a piece about one and one-half inches square and lay it on the bowl of a large tablespoon. Dip the spoon carefully into cold water so as to fill it, and wet the *under* side of the wafer *only*. Pour out the water and the wafer will sink into the hollow of the spoon. Place the powder to be enclosed into the centre of the wafer, and with the aid of a wet knife-blade fold over the sides of the wafer so as to enclose it, making gentle pressure with the blade on the folded ends so as to cause them to adhere. Fill the spoon again with water, and detach the wafer from the bottom, so that it will float freely. Insert the spoon well into the mouth and tip it up, and the water and wafer-packet will be swallowed without difficulty.

When the jujube capsules are used, fill the long part, packing the powder with a small stick, if necessary, and put on the short part which forms a cover. See that the outside is wiped clean of the powder before it is given. These may also be taken with a spoonful of cold water.

Suppositories may be introduced by having the patient lie on the side and then make an effort at bearing down. During such effort the suppository can readily be pushed into the bowel. Occasionally the presence of the suppository just within the opening of the bowel causes such discomfort that it may be expelled; it is, then, desirable to pass it up a couple of inches. To enable this to

be done without discomfort, an instrument called a suppository-syringe is sometimes employed.

Blisters.—Before applying a blister, the surface of the skin should be washed with soap, and rinsed, to free it completely from grease. Ordinarily, a blister will "draw" in about three hours; but the length of time varies with different persons, and with the part to which it is applied. Lift the edge occasionally, and when the skin is seen to have risen and shows little bladders of fluid, take off the blister and put on a hot poultice if it is desired to draw away much fluid. The large sac of fluid which usually follows may then be snipped in various places with scissors, and the fluid be allowed to ooze away. The blistered surface should be covered with a rag or lint spread with vaseline, cosmoline or sweet oil, and care be taken that the skin is not further disturbed unless it is desired to have a sore place.

Hot Stupes are only serviceable when they are applied as hot as can be borne. The best mode of doing this is to take a jack- (or roller) towel and put a broomstick or cane through each end of it. On it lay a flannel cloth folded to the form in which it is to be applied. Hold them over a dish and pour on boiling water until the flannel is soaked, then, by means of the sticks, twist the towel in opposite directions, and this will have the effect of wringing the flannel without risking scalded hands. When a roller clothes-wringer is to be had, this will answer the same purpose. Put the hot flannel on as soon as possible, and cover thoroughly with several folds of some dry, woollen material. The effect of the stupe may be increased by sprinkling it with a teaspoonful or two of turpentine.

Cold Applications.—When it is not convenient to apply ice to produce cold, as in a case of injury where it is necessary to avoid inflammation, cold water may be allowed to drip from a small hole in a suspended vessel of some sort. The surface on to which it falls should be covered with a piece of lint, and India-rubber cloth should be arranged so as to conduct the water away from the bed. If a very cold water is desirable, ice may be put into it.

If the dropping of the water is a source of annoyance, a piece of lamp-wicking may be attached by one end to the opening, and the other laid on the surface to be kept wet.

Liniments are commonly used either for the relief of pain seated within a limited space; to relieve chronic inflammation, by causing an irritation of the skin adjoining it; or to drive away a swelling. In the first instance aconite or some other benumbing agent is employed as a chief ingredient. In the second, the water of ammonia, tincture of cantharides or of capsicum, chloroform, oil of

cloves, turpentine, etc., are used; and in the latter, a greasy substance that will prevent the skin becoming sore with the prolonged rubbing, is most desirable.

The skin having been cleaned and dried, some of the liniment is to be poured on to it, and the ends of the fingers of one hand are to be firmly and slowly rubbed, with circular strokes, upon the part to be affected. When swelling is to be removed, the rubbing should always be from the extremities toward the body, as this helps to drive the blood and fluid out of the tissues.

Sometimes, in feeble persons, oil is rubbed into the skin in the same way, as a nourishment. This should be done before a fire, when possible.

Lotions are solutions of medicinal substances in water, or water and spirits, for external application. They are used solely for their local effect, as their ingredients are hardly likely to be absorbed. Generally they are applied to inflamed surfaces either as astringents or to produce cold. Water, if allowed to evaporate, will accomplish the latter, but it must be applied with a single fold of loose-textured, coarse muslin or linen, which must be kept wet, and it may be best to have the water ice-cold. Vinegar and water, or alcohol and water, used with brown paper, accomplishes this latter purpose—viz. : cooling—and nothing more.

Issues are made by inserting beads of wood or similar material into an open sore, so as to keep up a discharge of matter. They are rarely employed at the present day.

Moxas.—Little cones of camphor or of nitre, mixed with some vegetable powder, placed on the skin and burned for the purpose of creating a sore.

Cautery.—A very decided influence is sometimes required to be made upon the nerves of some part of the body, and to do this with less delay or pain than attends the use of a blister, a piece of iron attached to a handle is warmed to a white heat and applied lightly to the surface. The pain that attends the use of a *white*-hot iron is trivial compared to that caused by one which is only *red*-hot.

Setons are not now used as often as formerly. They consist of a piece of tape, oakum or lint passed through the flesh, and the ends tied together outside the wound to prevent their displacement. Their use is to keep up a constant discharge of matter.

Drainage-Tubes.—Not uncommonly, when death of a portion of a bone has taken place, and it is not expedient to remove it by operation, it is customary to insert into the sinus or canal which leads to it through the flesh, a piece of pure India-rubber tubing, that keeps the passage free for the discharge of fragments of dead bone; or to pass a twisted strand of oakum down to the seat of the dis-

ease for the same purpose. Either of these measures are also employed to allow a free discharge of matter from deep cavities caused by operations, or by the discharge of an abscess.

Temperature, and the Use of a Thermometer.

During health the temperature of the body is about 98.4° of Fahrenheit's scale—that is, a little less than 98½°. This varies somewhat during the day, being the highest about nine o'clock in the forenoon, and lowest about three hours after midnight. This range of temperature, as it is termed, is not much affected by the habits of healthy persons, although there are slight modifications peculiar to various ages. Food does not ordinarily raise the body-heat, although hot drinks may do so temporarily. Hot baths of air or water may raise it as much as a degree or two, but it falls again at once when they are discontinued. Alcoholic drinks, quite contrary to the general belief, lower the temperature of the body. Exercise and mental excitement cause a slight temporary rise.

The sense of touch, as conveyed by the hand, has ceased to be considered a reliable guide, since the temperature of the surface of the body exposed to the air may undergo considerable changes, owing to numerous circumstances, and the palms of the hands of a person coming from cool, outside air may convey an impression that the skin of an invalid is hot, when it is no warmer than natural. A dry skin often feels warmer than it really is, and a moist skin may convey a sense of coolness when the patient is really feverish. No physician of intelligence, therefore, places any reliance, as a rule, upon his sense of touch for information on this matter, but makes use of a thermometer which has been allowed to remain for at least five minutes in contact with some covered portion of the skin,—as an arm-pit or the fold of a groin—or which has been inserted for at least three minutes in the bowel, or four minutes in the mouth of a patient. The thermometer employed for this purpose differs only from that in ordinary use in having no metallic or wooden backing—the graduations being engraved on the glass itself; in its greater sensitiveness to impressions, owing to the fineness of the tube, and in being made to indicate variations only between the temperatures of 90° or 95° to 112° Fahr. These are called clinical or fever thermometers. It is now customary to use thermometers in which a detached thread of quicksilver remains in the tube, and which is left stationary when the metal recedes into the bulb as the thermometer cools. This is called the "index," and its upper extremity, or that which is furthest from

the bulb, is the one which indicates the height to which the column of mercury has risen.

In "taking the temperature" of a patient this "index" is shaken down until its upper end is about opposite the mark indicating 96°. An armpit is then wiped dry, and the bulb of the thermometer is placed so that when the arm is brought closely against the body, the upper end of the glass projects toward the front, and the mercury and the greater portion of the tube

FIGURE 269.—Clinical thermometer.

are entirely covered. After it has remained in this position for five to seven minutes, it is to be carefully removed, and the height to which the mercury has risen, carefully noted. It is desirable to write down at once, on paper, the time when the observation was made, and the exact height to which the column of quicksilver ascended.

When a thermometer is used in which there is no "index," it will obviously be necessary to note the position of the mercury before the instrument is removed from the armpit.

When a person is not in bed, and the armpit is inaccessible without removing most of the body-clothing, the bulb of the thermometer may be placed under the tongue, on either side, and well back toward its root; the lips should then be closed about the glass, and it may be left, as before, for about five minutes. With infants, it is customary to insert the bulb of the instrument into the bowel, since it would often be difficult to make use of either of the above named places, owing to the restlessness of the child. This may be done with but little disturbance, and, indeed, without awakening them when sleeping.

To read the indication it is necessary to know that it is customary to number only the marks indicating 95°, 100°, 105°, and 110°. The intermediate degrees have long marks, and each of the spaces so created are subdivided by four shorter marks, thus forming five divisions representing fifths of a degree of Fahrenheit's scale. Opposite the point of normal temperature it is customary to place a mark shaped like an arrow-head, for greater convenience of reference.

The usefulness of the thermometer in domestic practice consists largely in the information it affords of the comparative gravity of an attack of illness. Children are almost always rendered more feverish by slight disturbances of health than are adults, but

among either, a persistence, for any considerable time, of a temperature of 100° should lead to consultation of a physician. When a person appears ill, and the use of a thermometer shows that the temperature has risen to 101° or upward, unless it can be accounted for by an attack of indigestion, diarrhœa from some cause, or a catarrhal cold, etc., there is a probability that some acute disease is impending. The same may be said of a corresponding fall of the temperature two or three degrees below the normal point (98⅔°). After an ordinary attack of illness, such as ague and fever, if the temperature remains higher than natural, although the symptoms of the disease have otherwise disappeared and the patient may feel comparatively well, recovery is not perfect and suitable precautions should continue to be taken.

Another way in which the thermometer may render service in cases of illness, is, in noting for future reference the variations which the temperature undergoes at certain hours of the day and night. In many diseases these variations are markedly characteristic, and by their inspection alone, a physician may sometimes tell, with great certainty, the nature of the malady. The "range" of temperature, in a typical case of typhoid, has been illustrated in the chapter on Acute Infectious Diseases (page 25), and the diagram there shown is such as is ordinarily employed by physicians. It is not necessary, however, that this mode of recording it should be followed; all that is essential is to note the day of the month, the time of the day, and the exact temperature at that time.

It is rare for the temperature to exceed 106°, or to fall below 96° Fahr.

Other Signs of Disease have been mentioned with sufficient fulness in the first volume of this work. These should be studied by all nurses, and they should also acquire the ability to count the pulse at the wrist, and the number of respirations per minute. These should be written down *at once*, in some such way as the following (T. standing for temperature, P. for pulse, and R. for respirations):

		T.	P.	R.
April 25th.—	7.45 A.M.—	102¼°	96	28
	12 M.—	102°	92	26 — etc.

Reports.—A nurse can often render great service by acquiring the habit of always noting on paper the various occurrences of the sick-room at the time when they take place. Following the doctor's visit she should accompany him to another room after he has seen the patient, and receive from him explicit instructions regarding

what is to be done or noted during the interval that precedes his next visit. These instructions should be written out at the time, and should be followed as closely as the circumstances of the case will permit. At the next visit of the doctor he should have an opportunity before entering the patient's room, to see, written out, the nurse's observations.

Such a "log," as a sailor would call it, should have a column ruled off at the left margin of the paper for noting the time of the observations; and the latter should embrace all such matters of information as: the amount and character of sleep; cough; pain; fever, as measured by a thermometer; restlessness; vomiting, or movements of the bowels and their character; urine; perspiration; food taken (specifying how much); medicine administered; visits of friends or others—in fact, whatever may relate to the case. To keep such a memorandum well, so as to include that which is really valuable and leave out other things, requires skill and practice. It is better, for a beginner, to have the report too full than too scanty.

Operations.

It is not usual for operations to be made without some previous arrangement on the part of the surgeon as to the time, etc. He then directs what he would like to have provided. For nearly all operations of any importance the following arrangements may, however, be useful. If the patient is in bed, select an adjoining room for the operation. Have the temperature about 70° Fahr., and in front of a window place a table—an ordinary small kitchen table may answer if it is long enough, if not, a broad board resting upon secure supports. Under the end toward the window, or at the side on which the operation is to be made, protect the carpet with a square of India-rubber cloth from blood and the slopping of water. Fold a blanket and lay it on the table, and over it spread another piece of rubber cloth, or a sheet folded two or three times. Provide a *small*, firm pillow for the patient's head; a clean, empty bucket to receive blood and water from the sponges; an empty basin of some kind to use in case the patient vomits; a wash-bowl and pitcher of cold water; soap; a bucket or large pitcher of hot water; a plenty of clean towels; two or three sheets that the operator and his assistant (if one is needed) can pin about them to keep their clothes clean, and to cover the patient with during the operation; one or two empty buckets for dirty water; a few ounces of brandy, and some spirits of ammonia; a fan; ice; an extra woollen blanket in which to wrap the patient; a piece of strong, brown paper with which to make an ether-cone (if needed); pins; a couple

of needles threaded with strong, white cotton, and a straight-sided tin dish to hold water for warming adhesive plasters. The latter need not be brought until toward the end of the operation, as the water needs to be boiling. A small stand is desirable for holding instruments, and so are one or two firm chairs that are not upholstered. A large sponge may be useful in wiping up any "muss." A quantity of clean, soft cotton-wadding, and an old sheet that can be torn up for bandages, are often desirable.

It is customary to place a patient under ether before removal from the bed to the operating room, and for extra assistants to remain out of the room until the anæsthetic has rendered the patient unconscious of their presence. They should also retire, unless their presence is needed, before consciousness returns.

In preparing a patient for an operation, it is customary to empty the bowel with a dose of some medicine taken the night before, followed by an enema of warm soap-water in the morning. When an anæsthetic is used, no food whatever should be taken for at least four or five hours before, and it is better to allow only a very light breakfast of tea or coffee, and bread and butter; anything more than this should be ordered by the doctor.

It is better not to disturb the patient by loosening bandages or other dressings before the operation, as this can be done with greater comfort and ease after the anæsthetic has been taken.

Have the bed properly made while the operation is being performed, and put a foot-warmer, or a couple of well-corked bottles of hot water in the bed, and cover them up, so that it will be warmed. Protect the mattress by means of a rubber sheet, and lay a folded draw-sheet on the lower sheet, for the patient to lie on and to catch discharges.

Caring for the Dying and Dead.

Contrary to the general belief, death usually takes place without consciousness of suffering. Not unfrequently pain, distressful want of breath, convulsions, and restlessness cease as the end approaches, and although spasmodic movements of the muscles of respiration may sometimes occur, they are not usually attended with corresponding suffering. Even to the last the effort should be made to administer a few drops, if no more, of food or stimulants, and a little cloth attached firmly to a pencil, or similar piece of wood, may be used to clear the invalid's mouth of mucus when strength is so far gone as to prevent him doing it for himself; or a soft napkin wrapped about the end of a finger, or twisted into a cone, may serve the same purpose. Dryness of the mouth is

often the most distressing symptom, and lemon-juice with water, or a little vinegar with water, may be used to moisten it. Keep the limbs warm with hot bottles, raise the head and shoulders slightly on pillows if breathing appears difficult, use a fan to supply an abundance of fresh air, and, if necessary, open a window. Keep the room quiet, and do not allow strangers to be present unless it has been specially requested by members of the family or by the invalid.

The end oftentimes approaches so gradually that it is difficult to tell the moment of death. The breathing becomes slower and slower. Each breath is attended with a raising of the chest, and, it may be, with a deep sigh, and at last they cease entirely. A hand placed over the heart will detect pulsations for some time after they cease to be felt at the wrist.

After life has passed away, clear the room of those who are not needed to arrange the body, and carry out all articles used about the patient that are not wanted, fold a small sheet into the form of a diaper, and pin it about the hips, and with a folded napkin or handkerchief tied over the head, hold the lower jaw closed. Carefully wash and dry the entire surface, and remove the body from the bed to a board, like an ironing-board, covered with a folded sheet, or to a table, in the case of an infant. Fasten the feet together with a napkin, place the hands in an easy position, and cover with a clean sheet. Open a window so as to cool the room, and take out all the clothing, bedding, towels, etc., used about the patient.

Unless the weather is very warm, a corpse will keep for two or three days without the aid of ice. Undertakers generally insist that this precaution is necessary, but quite unjustifiably in most cases. In cold weather and in a cold room a corpse will sometimes be well preserved for more than a week. An exception to this occurs when death follows certain forms of blood-poisoning, in which decomposition seems almost to have set in before death. For many hours after death the body retains its warmth. Sometimes this is excessive, and is due to chemical changes in the tissues.

In nearly all cases, at a variable period after death, the muscles of the body become rigid and the joints stiffened. The rapidity with which this *rigor mortis* takes place varies with the cause of death and the state of the body at the time, but its occurrence is a pretty sure sign that death is real and not apparent. After decomposition has set in it disappears. When this shrinking of the muscles occurs, the skin also contracts, and hairs, like those of the beard, protrude further from their follicles or sheaths. This has given rise to the popular belief that the hair may continue to grow

long after death has taken place. It is better, for this reason, to defer the shaving of the face for a day or two in order that this contraction of the skin may be complete.

When death follows interference with breathing, and the lips, ears, and cheeks have acquired a bluish and dusky color, their natural hue may be soon restored by keeping the face covered with a muslin cloth wet with a solution of an ounce of saltpetre in a pint of cold water.

DIET AND THE PREPARATION OF FOOD FOR THE SICK.

WHILE properly the word *diet* includes in its meaning all food or victuals, it is, in the more restricted sense, of that only which is taken in the prevention and cure of disease, that we have to do in this work.

It was formerly a general practice to treat patients by depriving them almost entirely of food, in addition to blood-letting and the administration of physic. Happily, this method of treatment has been almost wholly discarded, and, as we believe, a much more rational one has taken its place. A sick person, as a rule, neither eats nor desires to eat as much as when in full health, but it by no means follows that because he is sick he must *not* be fed; for proper food is oftentimes more essential than medicines. Even those who are seriously ill should not, in this respect, be neglected. In such cases, articles of food which are stimulating, or contain nourishment in a concentrated form, may be used with the greatest possible benefit.

Among such articles may be enumerated milk, essence of beef, and beef-tea. Irritable stomachs will usually retain small quantities of these articles, given regularly and at short intervals, when they will reject a large quantity of any food that can be offered. Beef-tea and the essence of beef, however, are chiefly useful as stimulants, and contain only a very small amount of nutritive material. Milk and gruels are far more nutritious than these, and should not be displaced by them. Milk may be given to a patient with safety under any circumstances. If there is undue acidity of the stomach, the digestion of the milk may be aided by the addition of the time-honored liquid, lime-water, in the proportion of one tablespoonful to four or six of milk. Sometimes it can be taken and retained only in very small quantities—for example, a teaspoonful every ten or fifteen minutes—but such small doses may save the patient's life.

When the stomach absolutely and persistently rejects all forms of food, the system can be sustained for a long time by the use of nutritious injections consisting of milk, eggs, and other articles. Attention has recently been directed to the very remarkable value of the blood of animals, when used as a food and given by injection into the bowel. To use it in this manner, the blood should be stirred with a stick or with a whisp of broom-corn until all the fibrin, or clot, is removed, and then strained through a coarse towel, or something similar, to get rid of any small clots that may remain, and which might choke the nozzle of the injection syringe. It should be warmed to a temperature of 100° to 103° Fahr. just before it is used and, for an adult, four ounces or a teacupful is quite sufficient, while less may answer. This may be repeated at intervals of six hours, or even twice in the twenty-four hours. A larger quantity is liable to be expelled from the bowel. The blood of calves or sheep may be used when beef-blood is not to be had.

Children, especially, are apt to be very thirsty when suffering with fevers. Small bits of ice are useful in satisfying them when old enough not to swallow them entire, and at the same time will prevent their taking too much water.*

It is very important to see that such children, too young to make their wants known, are properly supplied with *water*. To illustrate this point we will relate a case : A child was moderately sick with scarlet fever, and one day, without assignable cause, its fever greatly increased. The child had a general look of anxiety, and frequently threw up its hands as though it wanted something. The mother finally thought that the baby wanted water, and when a gobletful was brought and put to its lips, the child seized it so firmly that it could not be withdrawn until the entire gobletful had been swallowed. Within twenty minutes the fever almost disappeared, and with a subsequent regular supply of drinking-water the case went on to convalescence without any more sudden and alarming changes. Water may be given to nursing babies without harm.

Tea is a stimulant, and is very grateful to most sick persons. It may be prepared to suit the taste of the patient, unless quite ill.

The ease with which food is digested is materially affected by the manner in which it is prepared. Cooking appears to lessen cohesion, and to so change the character of most substances as to make them more easy of mastication, and of being afterward digested.

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* See chapter on Nursing for a contrivance for keeping broken ice in a sick room.

The digestibility of meat stands in some proportion to its tenderness, and tenderness and digestibility are said to be much influenced by circumstances previous to cooking; for instance, flesh, whether of fish, fowl, or animal, if cooked immediately after death, before it has become stiff, is much more tender and easy of digestion than when it has been kept until the stiffening of the muscles has taken place. When this *rigor mortis*, as it is called, has occurred, meat, poultry, and game should be allowed to hang in a dark and cool place for a number of days, when they will again become tender and juicy, and their flavor will be then improved by cooking. Fish, however, is never so good as when it is the freshest. The flesh of animals which have been driven or hunted just prior to being killed is rendered more tender thereby.

Vegetables, in cooking, become softened, and their structure more or less loosened, so as to be readily mashed in the mouth and to permit the penetration of the juices of the stomach into their substance. Hard water has less of this useful effect than soft, and when salt is added to the water in which vegetables are boiling to preserve their color, as is often done, the eye is pleased at the sacrifice of tenderness.

The modes of cooking in common use are *baking* or *roasting*, *broiling*, *stewing*, *boiling*, and *frying*.

Baking or *roasting*.—Strictly speaking, very little roasting is done in this country, baking in a close oven almost wholly taking its place. This latter process, however, is commonly termed roasting, and is here specially treated of. In baking, the empyreumatic products are mainly retained, and the meat is thus rendered richer and stronger than by any other process of cooking. The operation being carried on in a confined space, the volatile fatty acids generated are prevented from escaping, and thus permeate the cooking articles. Meat prepared in this way is not well adapted for delicate persons, or for those who suffer from indigestion.

Broiling, properly performed, produces the same effect as roasting, and while the hardened surface-fibre is greater, on account of the relatively larger surface exposed to the fire, the natural juices of the meat are in a great measure retained. If the hard and scorched outside is carefully cut off, the appetizing juicy interior is in the most favorable condition for invalids, and for easy digestibility.

Stewing.—In this process the meat is usually cut up into comparatively small pieces and simmered, rather than boiled, in a small quantity of water. The juices and other portions which escape are not lost, but mingle with the water and form a thick gravy which is commonly served with the meat. Stewing, therefore, is

a healthful and nutritious way of preparing food. If, however, boiling be allowed to occur the meat becomes tough and hard.

By surrounding with water the vessel which contains the meat to be cooked, it may be stewed in its own vapor. For example, a chop or other small piece of meat may be placed in an ordinary preserve jar, with a piece of cloth tied over the top, and partially immersed in water. The water is made to simmer or gently boil, and in due time the meat is found perfectly soft and tender, and surrounded by a liquor composed of the juice which has escaped during the process. Meat thus prepared is in an exceedingly suitable state for the sick and the convalescent.

Hashing is the same process applied to previously cooked, instead of to fresh meat.

Boiling.—If the object to be attained by boiling is to impart to the surrounding liquid the goodness of the meat, as in making broths, soups, etc., the article used is first cut up into small bits and soaked in cold water for a short time. Heat should be gradually applied. If for soups, prolonged boiling is necessary in order fully to extract the gelatine, which, in fact, forms the basis of all soups. Thus treated, the nutritious portions of the meat, as far as possible, pass out into the water, and as this gains in strength of flavor and nutritive properties, the meat becomes impoverished and a hard fibrous residue is formed, insipid and of little value as food. When, however, it is desirable that the meat should retain its flavor and nutritive properties, it is to be plunged suddenly into boiling water and the process of boiling briskly maintained for five or ten minutes. This coagulates the albuminous matter upon the surface and forms a more or less impermeable external layer which serves to retain the juices. After this has been done it should gently simmer only, until fully cooked. Boiled in this manner, the interior part of the meat remains juicy and tender, and is in the highest degree nutritious and digestible. Brisk boiling throughout renders the fibre of meat tough and strong, and proportionably indigestible.

Fish, boiled in sea-water, or water to which salt has been added, is considered more highly flavored, and is more firm than when boiled in soft water. Food, when boiled, is more insipid than when cooked in other ways.

Frying is an objectionable way of cooking for persons having weak digestion. The meaning of the word frying is somewhat different in this country and in Europe. The method of cooking in a shallow dish and with a small amount of fat, here called frying, is the French *sauté;* while in Europe saying that food is *fried,* means that it has been placed into a vessel containing

enough boiling fat to entirely cover the article. In the latter case the effect of the intense heat of the fat is, in a measure, to seal up the surface of the meat, and to both prevent the escape of its juices and the entrance of the fat by which it is surrounded. Articles of food prepared by frying become, however, more or less penetrated with fatty matter, which causes it to resist, to a greater extent than otherwise, the solvent action of the gastric juices. It is apt, also, to be impregnated with the products arising from the decomposition of the fat or oil used in cooking. These are badly tolerated by the stomach, and may give rise to the gastric trouble known as heartburn.

The loss of weight in cooking beef and mutton is about as follows : A piece of beef weighing ten pounds, will lose, in boiling, two pounds ; in roasting, three pounds. A piece of mutton weighing ten pounds will lose two pounds in boiling, and three and a half pounds in roasting. This loss is mainly composed of the water contained in the substance of the meat, but some of the nutritive materials may also escape.

Rules to be Observed in Feeding the Sick—Appearance of Food, etc.

Those who are in health are more or less attracted, or repelled, by the appearance of the food set before them, the manner in which it is served, etc., and the sick are often even more sensitive in this particular. The plate or bowl in which food is presented should be scrupulously clean, and its contents neatly placed. Always thoroughly cleanse the cups, dishes and spoons used by sick persons, especially such as may have contained milk or anything which has a tendency to become sour.

A quantity of food, enough, and perhaps more than sufficient for a well person, will hardly fail to produce aversion and even nausea in one who is ill. A small amount, repeated, if desired, is more acceptable. Sometimes those who are only moderately sick will feel repelled from an otherwise acceptable dish, if the food requires any exertion to prepare it for eating. It is well, therefore, to consult them in advance as to whether they would not like to have the meat cut neatly for them, the potato mashed, the milk-toast divided into nice little squares, etc.

Food not taken, or, when a part only has been used, should not be left by the patient's side, or in sight, for several hours. It is rarely touched again, and may excite a disinclination to eat at all. Remove it after a few minutes, and if a desire is afterward expressed to try it, or to eat more, it is best to put it upon a clean

plate or bowl, and make it appear as if freshly prepared. If it has been warm or hot, see that it is made so again before offering it, or make another portion if necessary. It is always unpleasant to have food which should be served hot, presented nearly cold, and in sickness it is enough to effectually drive away any inclination to eat.

Small quantities.—While it is improper to unduly compel patients to take food, it is sometimes necessary that they should swallow more than inclination prompts, and in such cases small quantities at a time is the rule. Frequently, when a wineglassful of beef-tea or milk cannot be taken at once, a tablespoonful every half-hour will accomplish the same results, with the added advantage that with such a quantity a weakened stomach is more likely to perform its work properly.

Appetite should not be expected in sick persons, especially if they are fed frequently. Its absence may be considered as evidence of imperfect digestion. It is the duty of the nurse to discover, and properly present that which in each case appears to be best adapted to the changed condition of the body and mind.

Undue force should not be used to make patients eat, under the mistaken idea that if they can only get the food down, it will do good, for, unless it can be properly digested, it is far more likely to injure them than to do them good. Judicious persuasion may be employed, but it should not be forgotten that unless food is acceptable it may produce such an aversion as to render it absolutely impossible to swallow. Endeavor to stimulate the appetite by making whatever is offered pleasing to the eye and agreeable to the senses of smell and taste. Avoid the too frequent error of restricting the diet to one or two articles, but give as much variety as is consistent with the nature of the disease.

Food at night.—Do not allow the sick to become exhausted by permitting too long intervals to occur between the times of giving their food during the night. It is commonly a good rule to give something to eat the last thing before they settle down for the night; it will help to support them and prevent too great weakness in the morning.

Food in the morning.—The early morning is the time when the sick are most feeble; and at that hour they have less desire and strength to take food; something *to drink* should then be given, such as milk, or warm gruel or porridge, which will take the place of more solid food, that will be better relished after nine or ten o'clock.

Food and sleep.—While sleep is sometimes of more importance than food (and great care should be taken not to awaken the sick

unnecessarily) it should be remembered that the critically sick require food as well as sleep; and that from lack of it, they sometimes sink away and die, when, if they had been roused and had received food, they might have lived.

Insensible and delirious persons may be fed by first attracting their attention as much as possible, then putting the spoon to their lips and pressing down upon it, gently moving it back and forth until the lips instinctively separate, as they usually do, and then passing the spoon well into the mouth and emptying it *slowly*.

Diet for the Critically Sick.

By *critically* sick are meant those who are so extremely ill, or so prostrated from any cause, that their recovery is doubtful. In such cases, one of the highest authorities says: "When life seems passing away under their eyes, the friends will often shrink from tormenting (as it seems to them) the sick man with food. Let them not despair; many a one has recovered after the doctor has taken his leave with a sad shake of the head, and without making a fresh appointment." *

Gently and firmly, with soothing words of loving encouragement, the very sick should be induced to swallow some supporting food to the very end; its character, in such cases, must be mainly stimulating. It is best to give food of this kind in small quantities, from a tablespoonful to a wineglassful at a time, and at intervals of half an hour or more, as the state of the patient may seem to demand. Persons who are very weak should never be obliged to sit up to take their food. Cups with one side drawn out so as to form a spout, and partially covered, are made, and may be had at the drug stores in cities and the larger towns (Fig. 270), as may also drinking-tubes, made either of glass bent at an angle to facilitate its use (Fig. 271), or partly of glass and partly of rubber (Fig. 272); the former is best, as it is not easy to keep the rubber tube clean. When these cannot be obtained, the tube from a baby's nursing bottle will answer. In choosing glass tubes for this purpose, get those which have an inside diameter of about

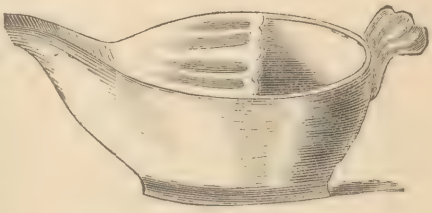

FIGURE 270.—Cup with mouth-piece for administering food or drink to an invalid.

* Thos. King Chambers, M.D., in Diet in Health and Disease, p. 235.

one-quarter of an inch. When they are smaller, they are apt to become clogged, and the patient becomes exhausted with the

FIGURE 271.—Glass tube for the same purpose.

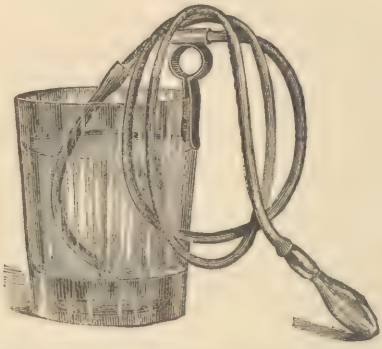

FIGURE 272.—A tube of india-rubber and glass, having a metal clip for attaching it to the edge of a glass or cup, so that an invalid may drink without holding the latter.

effort to draw through them as much as he requires, and thus takes less than he otherwise would do.

Diet for the Sick and Convalescent.

In administering food to the sick it would be absurd to attempt to follow any scientifically prepared rules, or dietary scales; the trouble usually is to get them to eat at all. Their tastes and prejudices must be consulted and humored, so far as consistent with their condition. Common-sense must be employed in selecting a variety of food, and if what is given is relished, and no harm seems to come from its use, it will probably do good.

When patients begin to recover, they are often fastidious and hard to please. So far as reasonable, their desires for special kinds of food should be gratified, always restricting them at first, however, to moderate quantities at a time. During sickness the appetite is almost or wholly lost, and when it begins to return it should be encouraged by longer and more nearly natural intervals between times for eating. A greater variety of dishes becomes available at one time or another, and should be made use of.

In selecting from the number of recipes which follow, it must be observed, that while any of them may be used in the various

stages of convalescence, those most suitable for ordinary cases of sickness come first in the list, progressing from forms of fluid food, which may be used in extreme cases, to those which are suitable for the nearly well.

Concentrated Meat-juice.

Take half a pound of lean meat, cut it finely, and put it into a preserve-jar, with two tablespoonfuls of cold water and a very little salt. Cover the jar with a saucer (right side uppermost) and then place it in a saucepan containing a small quantity of boiling water. Place the saucepan on a fire, and keep the water boiling for two hours. Then remove the jar, and press the meat out of the fluid, which should be set aside until it gets cold, when the fat can be skimmed from the surface. If a double saucepan is among your kitchen utensils, it will answer admirably in preparing this concentrated food.

Brandy Mixture.

Take four ounces (about eight tablespoonfuls) of brandy, the same quantity of cinnamon water, the yelks of two eggs, and a heaping tablespoonful of white sugar, or more, to suit the taste. Rub the yelks of the eggs and the sugar together, and add the cinnamon water and then the brandy, mixing them well together. To be given in doses of from two to four tablespoonfuls as a restorative and stimulant.

Essence of Beef.

Take a piece of rump or round steak, as large as the palm of the hand and about half an inch thick. Heat a frying-pan very hot and lay the beef upon it for a few seconds, and then turn it. Do not let it brown, but simply heat it through. Then, with a lemon-squeezer, press the juice into a hot cup and season with salt.

Beef-Tea.

Take a pound of beef from which all the fat has been removed. Cut it into very small pieces and put it into a preserve-jar with half a pint of cold water. Cover the jar and let it stand by the fire for an hour. Then place it in a pot containing enough hot water to rise to the same level with the meat and water inside the jar. Put the pot on the fire and let it simmer (not boil) at least three hours. As the water in the pot evaporates add more. Strain the broth through flannel, and season with pepper and salt to suit the taste. If only a very little beef-tea is required at a time, strain what is wanted and set the jar back into the pot of hot water, and keep it warm.

Beef-Tea, Another Method.

Take one pound of raw beef, minced, for each pint of water. Stir, while cold, and let it stand one hour. Then place the vessel in which they are mixed in a pan of water and let them simmer for another hour over a slow fire. If allowed to boil it becomes gluey, and is not equally nutritious or digestible. Strain the tea through a coarse strainer, and flavor at discretion.

Egg and Milk.

Take a fresh egg, beat it up with a very little salt, and pour into it a pint of boiling milk, being careful to stir it all the time. This is to be taken hot.

To Mull Wine.

Beat up the yelk of one or more eggs perfectly; scald a glassful or more, as required, of port or white wine, and melt in it a lump or two of sugar. Stir the egg rapidly one way, never changing the direction of the spoon, and keep stirring while you pour in the wine very gradually. Have another glass or basin ready, and pour the mixture quickly, two or three times, from one vessel to the other, which process makes it froth.

Gum-Arabic Water.

Put an ounce of fine gum, two ounces of sugar, and a pint of water, into a jar, and then set it in a saucepan of hot water, and stir occasionally until the gum is dissolved. This is very useful as a night drink for cough, and will allay tickling in the throat. It should be kept as hot as possible.

Another.

Dissolve an ounce of the best gum-Arabic in two pints of cold water, and flavor with lemon-peel.

Toast and Water.

Cut a slice of bread, and toast it to a rich brown color, without burning it. Put it into a jug with a thin slice of lemon, or a little nutmeg, and pour on it a quart of boiling water. When cold, strain it.

Flaxseed and Lemonade.

To three-quarters of a pint of warm water add two tablespoonfuls of flaxseed, and allow it to stand for one or two hours, then strain, sweeten, and add lemon-juice to taste. This is a good drink in case of sore throat.

Gelatinized Milk.

Dissolve a quarter of an ounce of gelatin in a quarter of a pint of boiling water; add to it a pint of hot milk; then put in two or three drops of essence of lemon or almonds, and sweeten to taste.

Flaxseed Tea.

Whole flaxseed, one ounce; white sugar, one ounce; liquorice-root, half an ounce; lemon-juice, four tablespoonfuls. Pour on the materials two pints of boiling water, let them stand in a hot place four hours, and then strain off the liquor.

Do not give this to patients taking medicines containing lead, iron, or copper.

Barley Water.

Take two ounces of pearl barley. Wash it with a little cold water, and strain. Then pour on it a pint of boiling water, and boil for a quarter of an hour; strain again, and throw away the water. Now pour on the barley two quarts of boiling water, and boil them down to one quart. Do not strain it, unless at the patient's request; it may be taken hot or cold. It may be sweetened if preferred, and any flavoring may be added. A piece of orange-peel may be boiled in the water, or some flavoring essence added afterward. If lemon-juice be added, it forms a capital cooling drink.

Barley Gruel.

Take two ounces of pearl barley, wash in clean cold water, then boil it for five minutes in a pint of water. Pour this water away, and put a quart of boiling water to the barley; let it boil for three hours, strain, and flavor to suit the taste; if that of lemon-peel is desired, cut it very thinly, and soak for ten minutes in enough cold water

to cover it; stir the liquid into the barley gruel. Equal quantities of milk and barley gruel make a very nourishing drink, especially useful in feverish cases. Barley gruel should not be mixed with milk or syrup before required for use, as in a warm atmosphere it undergoes changes, and sometimes slightly ferments.

Oatmeal Water.

Put a large tablespoonful of coarse oatmeal into a jug, pour over it a pint of cold water. Stir it well, allow it to stand until the oatmeal has settled at the bottom of the jug, then strain and use the water, either as a remedy for thirst or to make lemonade, to which it imparts a slight amount of nourishment.

Rice Water.

Wash two ounces of best rice, and boil it fast for half an hour in three pints of water. Any flavoring may be added, or a small piece of stick cinnamon or shred lemon-peel may be boiled with the rice, and sugar used, according to circumstances. Strain, and put the water aside to get cold

A Plain Egg-Nogg.

Beat the white and yelk of one egg together for five minutes, addding a small quantity of sifted sugar and a cup of warm or cold milk. To this may be added a small quantity of wine or brandy, and a grated nutmeg. If milk is not desired, beat the egg and sugar together, and add a little wine only.

Egg Nogg of the British Pharmacopœia.

Best French brandy, four ounces; cinnamon water, four ounces; yelks of two eggs; sugar, of each, half an ounce. Rub the sugar and egg-yelks together, then add the rest.

White Wine Whey.

White wine whey is made by adding a wineglassful of sherry to half a pint of boiling milk, and straining the mixture through a fine sieve. Sweeten the whey to suit the taste. The curds should not be used.

Rennet Whey.

Procure a piece of rennet (the stomach of the calf) from the butcher, place a small portion of it in a cup of hot water, and allow it to remain for four or five hours. Pour the liquid into a quart of milk, and let it stand till the curd appears. Then strain and use the whey, having sweetened it to suit the taste.

Sago Posset.

Put two ounces of sago into a quart of water, and boil until a mucilage is formed. Then take half a teaspoonful of essence of lemon, a teaspoonful of essence of ginger, and half a pint of sherry wine; mix and add this to the sago mucilage, and boil the whole for five minutes.

This is an excellent cordial where acute diseases, not of an inflammatory kind, have left the patient in a state of great debility. A large wineglassful may be taken at one time, at intervals of four and five hours.

Artificial Goat's Milk.

Take an ounce of fresh suet, cut into small pieces, and tie them loosely in a muslin bag; boil this in a quart of cow's milk, and sweetened with a quarter of an ounce of white sugar.

This is an excellent article of diet in scrofulous emaciation, and in the later stages of pulmonary consumption.

Mustard Whey.

Take half an ounce of bruised mustard seeds, and one pint of milk; boil them together until the milk is curdled, and strain to separate the whey. A teacupful at a time may be taken.

This whey has been found to be a useful drink in dropsy; it stimulates the kidneys, and consequently augments the urinary secretions.

Aromatic Barley Wine.

Take a quart of barley-water, and boil it down one-third; add to it, while it is hot, a pint of sherry wine, a teaspoonful of essence of cinnamon, and an ounce of sugar. A wineglassful, two or three times a day, is a good cordial in convalescence attended with much debility.

Toast and Wine.

Take a slice of nicely toasted bread; break it into small pieces and put in a bowl; pour over it rather more than enough water to soak it; sweeten and flavor with nutmeg and wine.

Plain Boiled Milk and Bread.

An old-fashioned dish, rarely well made. Put stale bread into a bowl, the pieces of of equal size, the shape of dice, but larger. Boil some milk, and the moment it rises pour it over the bread; cover the bowl close with a plate for ten minutes; the bread will then be perfectly and equally soaked. Add a little salt, or sugar, to taste.

Flour Caudle or Thick Milk.

Put a large spoonful of flour into about five spoonfuls of cold water, and mix thoroughly; heat five spoonfuls of fresh milk, slightly sweeten, and, when boiling, pour it gradually over the flour and water; put it on the fire and boil twenty minutes, stirring all the time. Add salt to taste.

Another mode is as follows: Tie a handful of dry flour tightly in a cloth, and boil for an hour, as if it were a dumpling; rub off the outer hard skin, and grate the flour; mix in milk as above. Baked flour may be used in a similar way.

This is good food for infants whose bowels are weak.

Water Panada.

Put a pint of cold water and two slices of dry bread into a stewpan and boil for three-quarters of an hour, stirring occasionally; add salt and stir in the yelk of an egg, and serve.

Milk Panada.

To a teacupful of stale bread-crumbs add boiling water sufficient to cover them, and, when soft, mix thoroughly. Put the mixture into a pint of milk, boil, and stir till it thickens. Sweeten, add salt, and flavor with lemon, almond, cinnamon, or vanilla, according to taste.

Broth Panada.

Use good broth or beef-tea; proceed as for water panada, omitting the egg.

Meat Panada.

To a teacupful of bread-crumbs add half a pint of boiling water and boil till it thickens; then mix it well with some kind of gravy or beef-extract.

Iceland Moss and Milk.

Take one ounce of Iceland moss, and soak it in half a pint of hot water for a quarter of an hour. Strain, and add the moss to a quart of water and boil till it is reduced to a pint. Strain again, and boil the water down to a third of a pint. Mix this with half a pint of hot milk, sweeten, and flavor to taste.

Milk-Rice.

Wash a quarter of a pound of rice, boil as directed above, and, having drained it, put it into a stewpan with half a pint of fresh milk; stir over the fire until the rice has absorbed the milk.

Richer Milk-Rice.

Soften, in plenty of hot water, two and a half ounces of best rice; cool with plenty of cold water, and drain. Boil three pints of milk in a two-quart stewpan; mix the rice in the milk and stir on the fire till boiling; add a tablespoonful of sugar and a small pinch of salt; boil for an hour; serve.

This is improved by adding more sugar, a small quantity of nutmeg, and wine.

Rice Gruel.

Take of ground rice two ounces; cinnamon, a quarter of an ounce; water, four pints. Boil for *forty* minutes. This is somewhat astringent and useful in cases of diarrhœa.

Oatmeal Tea.

Take of oatmeal a single handful; boiling water a gallon; mix in a deep vessel. Let the oatmeal settle, which it does in half an hour, and pour off the tea. By this process hard water is made potable.

Oatmeal Porridge.

In all cases oatmeal should be thoroughly boiled, and, though so simple, there is no dish requiring more care and attention in its preparation than an oatmeal porridge.

To a pint of boiling water slowly add a teaspoonful of oatmeal and half a teaspoonful of salt, stirring constantly with a wooden spoon, and afterward let the porridge boil for an hour, stirring occasionally to prevent sticking to the saucepan. When done, pour it out and serve with milk or cream. Those who like it may be allowed sugar or syrup.

Porridge is made lighter by longer boiling, and, for dyspeptic people especially, it should be boiled more than an hour, adding a little *boiling* water should it appear likely to thicken.

Sago.

Sago must be soaked before using. An ounce should be placed in a pint of water and allowed to stand on the back of the range or stove, or in the oven, for two hours. Then boil it till it is entirely soft, and flavor with lemon or a spoonful of wine, and sweeten.

Egg, Cream, and Sago Broth.

Take one ounce of sago and wash it well. Then stew it in half a pint of water till it is very soft, gradually evaporating it down to about one-half. Beat together one egg and a quarter of a pint of cream, and add this to the sago slowly, stirring well. Lastly, stir in, in the same way, one pint of good boiling beef-tea.

Arrow-root.

To one large tablespoonful of arrow-root add sufficient cold water to make a smooth, thin paste. Stir this gradually into a pint of boiling water, and flavor as required.

For "Milk Gruel" and "Milk Arrow-root," milk is substituted for water.

Sage Tea.

Take of leaves of green sage, plucked from the stalks and washed clean, half an ounce; sugar, one ounce; outer rind of lemon-peel, finely pared from the white, quarter of an ounce. Put them in two pints of boiling water, let them stand near the fire half an hour, then strain.

When the sage is dried, it must be used in rather less quantity than above mentioned.

Farinaceous Milk.

Take a pint of milk and one large teaspoonful of flour, corn-starch, or arrow-root; thoroughly mix either of the latter with a little cold milk; then add this to the rest of the milk when hot, and boil for five minutes, stirring all the time. Sweeten according to taste. The amount of farinaceous matter may be varied at pleasure, and a drop or two of essence of lemon, or cinnamon, or a small quantity of grated nutmeg, can be added to flavor it.

Port-wine Jelly.

Take one ounce of isinglass (Cooper's or Cox's shredded gelatine is the best) and one ounce of the best gum-Arabic, put them into a pint of port wine, and grate into it the whole of a small nutmeg; allow it to stand at least an hour; then put it over a slow fire until thoroughly dissolved, watching constantly to prevent burning; add sugar according to taste, and strain. Pour into a flat dish, and, when nearly cold, cut into squares.

This may be made of any other kind of wine or liquor, and forms a jelly stiff enough to be carried in the pocket. Give about a cubic inch when a patient feels weak.

Slippery-Elm Bark Jelly.

Take of the bark four ounces; pour on it a quart of cold water; let it stand all night; stir it thoroughly and let it settle; add the rind, thinly sliced, and the strained juice of a lemon; add sugar, simmer gently for a quarter of an hour; then strain into a mould and let it cool.

Vegetable Soup.

Take two large peeled potatoes, an onion, and crumb up half a pound of stale bread; put them into a quart of water and boil until reduced to a pint; strain and add a few sprigs of parsley and a small quantity of salt, and, if desired, pepper; cover, and allow it to get cold. May be warmed for use. When animal food is inadmissible, this is a good article of diet.

Farinaceous Milk Pudding.

Take a pint of milk and one large tablespoonful of flour, corn-flour, ground rice, or arrow-root, one egg, and one tablespoonful of sugar. Mix the flour with a little cold milk. Boil the rest of the milk, and pour it boiling on the paste. Then stir in the egg and sugar, which have been previously beaten together, pour into a dish, and bake for fifteen minutes. If preferred, the whole may be boiled for five minutes, stirring all the time.

Rice Cream.

Bake one ounce of best rice in a pint of milk; when done, remove the skin from the top. Dissolve a quarter of an ounce of gelatine, previously soaked in two tablespoonfuls of cold milk, in a quarter of a pint of boiling milk or cream; add the yelks of two eggs, two ounces of sugar, and a small quantity of the extract of vanilla; stir over the fire for five minutes, mix with the rice, pour it into a mould, and let it remain until set. More or less sugar may be used, according to taste; the quantity given will make the cream rather sweet.

Lemon Cream.

Put into half a pint of boiling water the peel of two lemons, very thinly shred, and allow it to simmer for a quarter of an hour; then boil half a pound of sugar in it for two minutes, strain it, add three eggs (the whites and yolks beaten together) and the juice of the lemons; stir until thick, it will take about twenty minutes. Have ready a quarter of an ounce of gelatine, soaked in a spoonful of cold water, and when the cream is poured into a basin, put the gelatine, with another spoonful of water, into the stew-pan, and stir until dissolved; when both are nearly cold, mix thoroughly together, and put the cream into a mould. It should stand until the next day. This will be useful where milk or cream is not allowed, and is nourishing and delicious.

Arrow-root or Corn-starch Blanc Mange.

Take two large tablespoonfuls of either of these, one pint of milk, sugar and flavoring to taste. Mix with a little of the milk, boil the rest, and stir in with the paste. Boil all together for ten minutes, stirring constantly. Pour into a mould, and allow it to cool.

Puddings.

In making puddings with milk and eggs, the milk must always be boiled, as this prevents curdling. It is a good plan to boil the sugar with the milk, and then pour them on the eggs. Very slow baking is absolutely necessary for all puddings which have custard; if quickly baked, the custard is often mixed with the more solid portion of the pudding, and it is also rendered tough and unsuitable for invalids.

Savory Bread Pudding.

Pour half a pint of beef-tea, boiling, over a cup of bread-crumbs; beat well together, and let it soak for half an hour; then add two eggs beaten with a quarter of a pint of boiling milk. Season with pepper and salt, beat together for five minutes, put the pudding into a buttered dish, and bake for three-quarters of an hour.

Hasty Pudding.

Mix two ounces of flour smoothly in a little cold milk, stir it into half a pint of boiling milk; add a well-beaten egg; sweeten, and flavor with grated nutmeg, add a pinch of salt, and stir over a slow fire until the pudding thickens. Turn it out and serve.

Ground Rice Pudding.

Mix two tablespoonfuls of ground rice with half a pint of cold milk; pour upon them half a pint of boiling milk, in which a heaping tablespoonful of sugar has been dissolved; add flavoring to suit, one egg well beaten, and stir over the fire for ten minutes; bake in a buttered dish for three-quarters of an hour.

Tapioca Jelly.

Put two ounces of tapioca into a bowl with half a pint of cold water and the grated peel of a lemon. Set the bowl in a saucepan of water, and keep it boiling. When the tapioca begins to thicken, stir in another half-pint of water, let it boil gently for an hour, stirring occasionally. Sweeten with sifted sugar, and pour into a mould.

Let it stand until cold, when it will turn out of the mould a stiff jelly. If approved, a little sherry or brandy may be added, so much less water being used. This jelly is light, nourishing, and very delicate.

Orange Jelly.

Take one ounce, or half a package, of Cox's or Cooper's gelatine; squeeze enough oranges to make a pint of juice; soak the gelatine in the juice with half or three-quarters of a pound of sugar, for an hour; then add one pint of boiling water, stir till dissolved, and strain into a mould. If put on ice it will harden quickly, and is very acceptable often when wine jelly would be too stimulating.

Snow Pudding.

One two-ounce package of Cox's or Cooper's gelatine, dissolved in one quart of boiling water. Beat the whites of five eggs to a froth. After the gelatine is cold, stir into it alternately two large cups of sugar and a few spoonfuls of the beaten egg, till all is thoroughly mixed. Then add the juice of four lemons, beating continuously while mixing. Beat in all about twenty minutes. Pour into moulds, and, when hardened, serve with boiled custard or whipped cream.

Apple Soufflé.

Bake two or three sour apples, scrape out the pulp, sweeten with powdered sugar, and add the white of an egg beaten to a stiff froth. Put it on a flat tin dish and bake in a moderately heated oven a quarter of an hour, or until it puffs up. Serve immediately. Flavoring may be added to suit the taste.

Apple Purée.

Bake good sour apples, remove the pulp with a spoon, and beat it up with a little sugar. To a teacup use the yelk of an egg and a penny sponge-cake; mix, and rub through a sieve.

This is nourishing, and useful in some cases where cream or custard is objectionable.

Mutton Broth.

Take of lean loin of mutton, one pound, exclusive of bone; water, three pints, boil gently till very tender, putting in a small quantity of salt, and an onion, if agreeable. Pour the broth into a basin, and when it is cold skim off all the fat.

It can be warmed as wanted. If barley or rice is added, as is desirable during convalescence, they must first be boiled separately till quite soft, and then added when the broth is heated for use.

Egg and Corn Flour Broth.

Take one large teaspoonful of corn flour and half a pint of cold water. Mix the corn flour smoothly with a small portion of the water, then add the remainder. Heat it over the fire, stirring continuously, and remove when it thickens. Mix with it gradually one pint of hot beef-tea. When it has become nearly cool enough to swallow, stir into it one well-beaten egg.

The egg may be omitted when it is known to disagree.

Baked Flour Broth.

To make the broth, a good teaspoonful of baked flour should be mixed smoothly with a small quantity of cold water, then stirred into a quarter of a pint of hot water, and the whole should be made to boil; a pint of hot beef-tea or mutton-broth should then be added.

Clam Broth.

Chop into small pieces a dozen hard clams, and boil them a few minutes in their juice. Strain and pour over crackers.

Mutton Soup.

Chop three pounds of neck of mutton into small pieces, put them into three pints of water, with a large chopped turnip and a pinch of salt. As soon as the water boils, skim thoroughly, and allow it to continue to boil gently for three hours; then strain, and let the broth cool in order to remove the fat. Boil it again; stir in a teaspoonful of flour mixed smooth in a half-pint of milk or cream; let it thicken; season to taste, and serve. If there is no objection, the flavor may be heightened by using a sprig of thyme, and rather more turnip, and a sliced onion.

Stewed Prunes.

Wash the fruit, and for every pound allow a half-pound of sugar and one pint of water. Boil the sugar and water together for ten minutes, then put in the fruit and let it boil gently for two hours, or until perfectly tender, so that it breaks if touched with the finger. Drain the syrup from the prunes, and boil it until it becomes thick; then put the prunes back into it, and let them stand until the next day.

Omelet.

To be suitable for invalids, omelets should be cooked with as little butter as possible, and be very lightly fried.

Put half an ounce of butter into the omelet pan; as soon as it is hot, pour in gently two eggs well beaten, with a tablespoonful of milk, a little chopped parsley, pepper and salt; let them rest quiet, the fire being gentle, for half a minute, then, with a fork, stir in the middle of the pan to prevent the omelet catching there; in less than a minute it will be nearly done. Now hold the pan over the fire and shake gently, until the omelet is done; now fold it over, slide it on to a dish, and serve immediately.

"The Invalid's Mashed Potato."

Boil one pound of potatoes, with their jackets on, till they are tender or brittle. Peel them and rub them through a fine sieve; when cool, add a small teacupful of fresh milk or cream and a small quantity of salt, beating lightly as you go on, till it is quite smooth, and warm it gently for use.

Orange Cream.

Take two oranges; grate the peel, and put it and the juice, with a cup of finely powdered sugar, into a half-cupful of water. To this add four well-beaten eggs, and beat all together for some time. Strain the whole through flannel into a saucepan and set it over a gentle fire, stirring it one way until it is scalding hot and thick. Do not let it boil, for it will curdle. Serve as custard in jelly-glasses.

MATERIA MEDICA.

THIS term indicates the branch of science which relates to the nature of the substances used as medicines. Their preparation from the crude drugs in such manner as to be most easily used or most efficacious is called *pharmacy*. The number of articles having more or less medicinal value is very great, and, quite naturally, the number in actual use varies in different countries. Those that are native to the country are most commonly employed, in the case of such as are of vegetable origin. This, to a certain extent, is so in the United States; but while our native drugs are some of them very valuable, there are others—like opium, camphor, Peruvian bark, rhubarb, assafœtida, nux vomica, etc.—which are brought from abroad.

Formerly, animal and vegetable substances were almost exclusively used as medicines, but drugs of inorganic origin are now largely resorted to, while substances of animal origin have become very few; cod-liver oil, pepsin, cantharides, musk, and spermaceti, being almost the only ones now made use of.

The collection of plants of value as medicines requires considerable knowledge of their appearance, and of the places where they are apt to be found, as well as of the time when they contain their properties in most active form. Care is also required in their preservation, and, for domestic use, a knowledge as to how to prepare them.

It is obvious that only the simplest preparations can be made without a knowledge of pharmacy and the possession of the necessary apparatus. Practically, *infusions*, or solutions made by soaking plants in water; *decoctions*, or teas made by steeping or boiling plants in water; and *tinctures*, made by soaking plants in alcohol or spirits, and, occasionally, powders and salves, are the only forms available for domestic manufacture. These, however, if made with fresh plants, are often more valuable as regards their effects, although less convenient and easy of admin-

istration than the fluid and solid extracts, elixirs, pills, emulsions, syrups, and other compounds made by apothecaries. For the latter reasons it will usually be better to obtain all medicines of an apothecary when it is possible to do so.

In collecting plants they should be taken when the leaves are free from rain or dew; they should, if possible, be collected fresh every year, and, when the *tops* are the parts used, the flowers should have blossomed and the seeds should not be developed. When the *seeds* are the portions sought, they should have become ripe. *Roots* should be dug up in the fall, after the tops have withered, or in the spring, before the stems have commenced to grow. *Barks* should be peeled off in the spring.

As soon as possible after plants, roots, seeds, or barks are gathered, they should be quickly dried in the shade with a free exposure to air, and be then tied up securely in paper and placed where they are not exposed to damp air or insects. Roots should not be washed, but when the dirt on them has become dry it should be brushed off, and in the case of large roots, cutting them up into moderate-sized pieces will hasten their drying.

In administering medicines it is customary, though less so than formerly, to combine them with a view to modifying their individual effects, or to avoid the necessity of giving a large number of separate doses. The art of doing this, however, requires more knowledge of their individual properties and their effects upon disease than can be obtained without much study, since the substances chosen and their various proportions require to be varied more or less in every case. Experience has shown, however, that certain combinations are generally applicable in a large number of cases, and since it is desirable to save the labor and expense of writing and compounding such mixtures or combinations in each case, definite and descriptive names have been given to many such compounds, and, when made according to methods that have generally been agreed upon by physicians and apothecaries, they are known as "*officinal*" or "*pharmacopœial*" preparations, and the works in which they are described are called *pharmacopœias*. Such formulas or recipes are used only for the sake of convenience, and physicians are at liberty, of course, to adopt others whenever, in their opinion, others will better serve their purpose. Many of the secret preparations sold in the shops are nothing more than such as are regularly made by apothecaries, but called by other and more fanciful titles.

The doses of medicines appropriate for different ages cannot be fixed accurately by any rule, since they vary with the nature of the disease; moreover, certain medicines are relatively more

active or less active in the case of infants and children than in adults. The following table is sometimes used as a general guide to the size of doses, but the only *real* guide is the effect which the remedy produces.

Taking the dose for an adult as unity:

A patient under 1 year of age would require from					$\frac{1}{16}$ to $\frac{1}{12}$	of this dose.
"	" 2	"	"	$\frac{1}{8}$		"
"	" 3	"	"	$\frac{1}{6}$		"
"	" 4	"	"	$\frac{1}{4}$		"
"	" 7	"	"	$\frac{1}{3}$		"
"	" 14	"	"	$\frac{1}{2}$		"
"	" 20	"	"	$\frac{2}{3}$		"

A patient from 20 to 50 years of age would require the full dose.

Another rule to follow in the case of children under 12 is to add their age in years to 12 and divide the product by the age:

Child's age..... 4
Add..... 12
Total, divided by age..... 4) 16 (4 or $\frac{1}{4}$ = single dose.

The weights and measures used in this country in preparing and dispensing medicines are as follows:

Troy Weights.

The grain.....	written	gr.			
The scruple.....	"	℈,	equal to	20	gr. (gr. xx.).
The drachm.....	"	ʒ,	"	60	" or ℈iij.
The ounce.....	"	℥,	"	480	" " ℈xxiv. or ʒ viij.

In other words,

20 grains make 1 scruple (℈i.).
3 scruples " 1 drachm (ʒ i.).
8 drachms " 1 ounce (℥ i.).

Fluid Measure.

The minim.....	written	♏			
The fluid drachm.....	"	f ʒ	equal to	60	minims (♏lx.).
The fluid ounce.....	"	f ℥	"	480	" or ʒ viij.
The pint.....	"	O	"	f ℥ xvj.	
The gallon.....	"	cong.	"	Oviii.	

It is not to be expected that all the medicines here referred to are desirable to have constantly on hand for domestic use, since the need for most of them may arise but seldom, and they can then be obtained fresh from an apothecary, as they are wanted. Certain articles, however, should be kept in every family, as they are likely to be serviceable in emergencies, or may prevent delay in obtaining them even when a physician is called in. All such

medicines should be put into carefully closed bottles, jars, or boxes; they should be distinctly labeled with the name and dose, and they should all be kept in some secure place where they may not be accessible to children and may be easy of access for those who are competent to use them.

It will be well to make a distinction in the vials which hold remedies that are intended only for external use or which are more than ordinarily poisonous, so that even in the dark the attention may be attracted to the care needed in using their contents. For example, aconite, laudanum, liniments, etc., may be kept in square vials, while spirit of Mindererus, lime-water, bitter tinctures, castor-oil, the ordinary cough mixtures, diarrhœa remedies, etc., may be in round ones. A small case provided with shelves and a drawer, closed with locked doors, and arranged to hang on the wall, will prove to be convenient.

The following are recommended as calculated to be most often serviceable, and pains should be taken to learn their properties so that they may be used with intelligence. Others may from time to time be added to, or substituted for them as the ordinary needs and experience of the family may indicate:

Laudanum (Tincture of Opium).—Dose for an adult, fifteen to twenty drops. Small children are very susceptible to its effects, and it should not be given to them, except with the directions of a physician. Discontinue its use when it causes drowsiness.

Tincture of Nux Vomica.—Dose for an adult, five to fifteen drops, or even less. It is a very valuable remedy in habitual constipation and in the dyspepsia of nervous and overworked people.

Tincture of Belladonna.—Dose for an adult, five to fifteen drops. Especially valuable in acute sore throat with pain during swallowing, whooping-cough, excessive perspiration or night-sweats, some forms of cough, incontinence of urine, etc. When the pupils of the eyes become large, and there is a flushed face and dryness of the throat, stop its use for a time.

Tincture of Aconite.—Dose for an adult, three to six drops. Even less when given at short intervals. A drop every fifteen minutes until there is perspiration on the face or a decline of fever, will often arrest a cold in its commencement, or cut short an inflammation. It is chiefly used to lessen fever, or, applied externally, to relieve neuralgic pain. Be careful not to get it on the lips (unless it is very dilute) or into the eyes.

Compound Soap Liniment.—Useful for sprains, bruises, or soreness of the muscles, in which latter case apply it with gentle rubbing.

Paregoric Elixir (Camphorated Tincture of Opium).—Dose for an adult, two teaspoonfuls. An excellent remedy for diarrhœa, bellyache, and to quiet cough.

Sweet Spirit of Nitre (Spirit of Nitrous Ether).—In doses for an adult, of two teaspoonfuls, with water, it increases the activity of the kidneys.

Hoffman's Anodyne (Compound Spirit of Ether).—Dose for an adult, two teaspoonfuls, with water. Relieves spasm, "nervousness," the pain of menstrual periods, and some forms of headache.

Aromatic Spirit of Ammonia.—A teaspoonful with cold water is serviceable in sick headache, or as a stimulant in cases of faintness. The vapor may also be inhaled.

Tincture of Ipecac.—A couple of teaspoonfuls, with warm water, will cause vomiting. Two drops, with a little cold water, will have a contrary effect, and will often quiet nausea. Ten drops, with half to one teaspoonful of paregoric, is a good remedy for simple coughs.

Tincture of Camphor.—A few drops in cold water is useful as a stimulant in headache. Rubbed on the skin it causes redness.

Compound Licorice Powder consists largely of senna and sulphur. A teaspoonful in a half-glass of cold water, taken on going to bed, acts as a mild laxative.

Sulphate of Cinchonidia, made into six-grain powders, for convenience sake, is useful in malarial fevers and neuralgia, and while much less expensive than sulphate of quinia, is very nearly as efficacious. Half this amount, taken before meals, serves as a tonic.

Bromide of Sodium, in thirty-grain powders. Taken with a wineglassful of water, it relieves headache and restlessness, causes sleep, quiets a "nervous" cough, and controls spasmodic affections, such as hysteria, etc.

Compound Rhubarb Pills usually contain three grains each; two to four act as a cathartic of rather greater power than the compound licorice powder.

Powdered Chlorate of Potash, dissolved in cold water, is much used as a gargle for sore mouths and throats.

Powdered Alum.—A heaped teaspoonful in a quart of water is serviceable as an injection for leucorrhœa, or, applied with cloths, to relieve inflammation of the skin. A teaspoonful with warm water acts promptly as an emetic when swallowed.

Powdered Borax is used for similar purposes as the chlorate of potash.

Bicarbonate of Soda (ordinary baking soda), when made into a paste with *cold* water, is one of the most efficacious applications to burns and scalds. Ten to thirty grains, taken with cold water, relieves heart-burn.

Vaseline, or **Cosmoline Cerate**, is better than the ordinary kind, owing to the fact that it does not become rancid by keeping.

Adhesive Plaster.

Lime Water may be added to the list, since it serves, when given with four parts of milk, to check nausea or vomiting, especially in babies; and with equal parts of linseed oil (or even sweet oil) it forms a thick, white mixture, known as Carron liniment, which is used on cloths as a dressing for burns.

It is customary, for convenience sake, to arrange medicines in classes according to one or more of their *general* effects: but all remedies have certain effects peculiar to them, or depending upon the quantity given or other circumstances attending their administration; and there are few remedies—even the oldest known—about which something more is not being learned almost daily. The following will illustrate some of these general classes:

Astringents are such substances as cause contraction of the soft tissues of the body to which they are applied. They accomplish this in several ways, but usually by their local effects. When applied too freely they may cause irritation. They are chiefly valuable when there is relaxation or swelling of the surface, attended with an over-fulness of its blood-vessels, as in congestion of the skin and mucous membrane—such as occurs in sore throat or in simple diarrhœa. They are also serviceable in arrest-

ing bleeding from small vessels. Astringents may be either vegetable or mineral. The former nearly always depend for their activity upon tannin (or tannic acid) or gallic acid which is made from it. Nearly all vegetable substances which impart a puckery taste contain this first-named acid in one form or another—viz., galls, persimmons, oak-bark, hemlock-bark, catechu, kino, log-wood, rhatany, blackberry root, pomegranate-root bark, geranium root, etc.

The most important mineral astringents are alum, acetate of lead, sulphate of zinc, subcarbonate or subnitrate of bismuth, and sulphate of copper.

Astringents should not be taken into the stomach shortly before eating, nor during digestion, and should be used either in dilute form or in pills. When applied externally they usually act best when in cold water, or mixed with glycerin or some oily or fatty substance that is free from rancidity. Astringent eye-washes should *never* be made with lead preparations.

Tonics are remedies which improve the health generally. They aid digestion and other functions of the body, and increase nutrition and muscular strength. They are slower in their action than stimulants, and, unlike the latter, are not followed by reaction. Some have a special influence upon certain parts, like bitters upon the stomach, iron upon the blood, phosphorus and strychnia upon the nervous system. The bitter tonics, when taken shortly before a meal, excite the appetite and cause a greater flow of gastric juice, but when used in too large doses they may derange the digestive organs and cause headache. The simple bitters, which have the effect only of improving the appetite and digestion, are quassia, gentian, barberry, columbo, boneset, goldthread, centaury, dogwood, yellow root, etc.

Certain bitters possess peculiar properties, such as wild-cherry bark, in which there is a small amount of hydrocyanic acid that acts as a sedative; Peruvian bark, which contains quinia, cinchonidia, and other substances that are especially useful in malarial diseases. Others have aromatic principles rendering them more stimulating than the simple bitters, like chamomile flowers, Virginia snake-root, and cascarilla bark. In others the aromatic substances are in larger proportion and the bitter principle is less abundant or quite absent, as cinnamon, cloves, nutmeg, allspice, ginger, cardamom, pepper, etc. These are not unfrequently classed as stimulants.

Among the mineral tonics, preparations of iron increase the richness of the blood in red gobules. The mineral acids (especially hydrochloric, which aids digestion) produce an improvement in

general nutrition when not too long nor too freely administered. Phosphorus and strychnia in proper doses increase the nutrition of the nervous system.

The bitter tonics, with iron, are usually of service after fevers, or when the health has suffered from over-work, deprivation of air and sunlight, but in any case the aid of hygienic measures is essential to their favorable action.

Stimulants commonly increase the force with which the heart acts, and are applicable in all cases of loss of heart-power from disease or nervous shock. The remedies of this class are ammonia, turpentine, and the various alcoholic drinks. Digitalis has a special effect in making the heart's beat stronger and slower when it is acting rapidly and feebly.

Sedatives are the opposite of the foregoing in effect, and when given internally lessen, and sometimes (in large doses) arrest the heart's action. To this class belong many of the most deadly poisons, such as preparations of antimony, aconite, veratrum, and prussic acid. They are employed to subdue inflammation, lessen fever, and quiet the heart's action, and for this purpose are administered in a great variety of inflammatory and febrile diseases. Their use requires caution.

Antispasmodics are remedies which act upon the nervous system much as stimulants do upon the heart. They are useful in such affections as St. Vitus' dance, hysteria, colic, etc. Among them are musk, camphor, valerian, assafœtida, ether, black snake-root, hops, etc.

Anodynes or **Analgetics** are medicines which relieve pain. Chief among these is opium and its various alkaloids, such as morphia, codeia, etc., and hemp. There are a number of remedies which, in addition to the power of alleviating pain, have the property of causing the pupil to enlarge. These are belladonna, hyoscyamus and stramonium, their pain-relieving power is, however, much less than that of opium. They are sometimes called mydriatics owing to their influence upon the eye.

Still another section of this class is known as **Anæsthetics.** They are used by inhalation and have the power of causing temporary unconsciousness ; these are nitrous oxide or laughing-gas, ether, chloroform, and a few others. They are all extremely volatile and vary somewhat in their effects.

There are two classes of remedies which exert their influence almost entirely upon the nervous system. Strychnia is the notable one of this **Excito-motor** class as it is called. Under its influence the reflex irritability of the spinal cord (see vol. I., pages 77 and 539) becomes so much increased, that when it is given in over-

doses, slight impressions made upon the surface of the body cause convulsion or spasm of the muscles.

Opposed to the *excito-motor* class of remedies, are the **Depresso-motor,** or those which diminish the susceptibility of the spinal cord and brain to external impressions. The bromides of ammonium, potassium, or sodium, together with chloral, conium, lobelia (or Indian tobacco), and nitrite of amyl are examples.

Lastly, among the remedies which affect the system generally, are those known as

Alteratives.—These are medicines which modify in some manner the nutrition of the body, but which show no other evidence of their effects (unless they are given in too large or long-continued doses) than the improvement in health which follows their use. Such remedies are often spoken of as "blood-purifiers." Many of the most powerful medicines belong to this class, such as mercury, arsenic, iodine, bromine, chlorate of potash, muriate of ammonia, alkalies, cod-liver oil, colchicum, sarsaparilla, dandelion, guaiacum, mezerium, etc. Such remedies are resorted to in rheumatism, gout, syphilis, rickets, etc. Under the influence of appropriate alteratives, aided by habits of life calculated to improve the health generally, the diseased portions of the body undergo such changes that their particles are replaced by others of a more healthy character, and the invalid is gradually restored more or less completely to health. The application of these remedies in these various diseases has been referred to elsewhere.

Certain remedies have effects that are mainly local, or which are manifested upon special organs. Some of these belong to the class of those which affect the system generally, but depend for such local action upon the mode of administration. Of these,

Emetics are medicines which cause vomiting. Sometimes, though not ordinarily, this is accomplished without preceding nausea. Some of this class act by the irritation which they create—mustard, blue vitriol (sulphate of copper), and sulphate of zinc are of this class. They are "mechanical" remedies and do not require to be absorbed into the blood to produce their effect. Others, like tartar-emetic and apomorphia, are typical examples of the class that operate through the nerves, and require to be first absorbed by the blood and carried to the nerve-centres. The first need to be taken into the stomach directly; the others may be taken in this manner, or they may be injected into the bowel, or into a vein, by means of a hypodermic syringe.

The choice of an emetic depends upon the purpose to be accomplished. When it is simply desired to *unload the stomach* of poisons or undigested substances, ipecac, mustard flour, sulphate

of copper, turpeth mineral, sulphate of zinc, or powdered alum are serviceable. When foreign bodies are to be dislodged from the windpipe, the same agents will suffice, and ordinarily they act without causing much nausea. When, however, it is desired to *lessen the force of the heart's action* or *reduce inflammation*, a moderate amount of nausea is desirable, and tartar-emetic may be used.

Cathartics are medicines which cause an evacuation of the bowels. They are subdivided according to their activity into *laxatives* (aperients or lenitives)—medicines which simply cause the bowel to discharge its contents, but do not cause purging; *purgatives* (or purges)—or such as produce frequent and loose movements, but which do not act so freely as to cause exhaustion; *hydragogues*—those which cause profuse and watery discharges, and which in large doses may have harmful effects; and *drastics*, which are so irritant in character as to act as poisons when given in too large doses.

To the first class of remedies belong simple enemas of water, or soap-water, and those which increase the tone of the muscular coat of the bowel—such as nux vomica—or those which cause slight stimulation of the intestine and increase the contraction of its muscles, like oat-meal, unbolted flour, figs and dried fruit of all kinds, etc. Molasses and brown sugar have a laxative effect, and so has milk with some people. Among medicinal substances tamarinds, manna, magnesia, and sulphur, are the chief.

Purging remedies embrace castor-oil, calomel, blue-mass, rhubarb (has often a constipating effect as a reaction), aloes, senna, Epsom salt, Glauber salt, citrate of magnesia, and Rochelle salt, or Seidlitz powder.

Drastic medicines include jalap, colocynth, scammony, may-apple root (or its active principle, podophyllum), elaterium, gamboge, and croton-oil.

Diuretics are substances which cause an increased flow of urine. They are not very certain in their action, especially when the skin has a tendency to perspire. They are chiefly serviceable to stimulate the kidneys in cases of dropsy, and to render the urine less acid by increasing the proportion of water to soluble matters. The chief diuretics are squill, digitalis, broom, spirit of nitric ether, buchu, bearberry, juniper, wild carrot, fleabane, turpentine, copaiba balsam, cubebs, and certain of the potash salts—such as the acetate, citrate, bitartrate (or cream of tartar), and nitrate (nitre or saltpetre).

Diaphoretics increase the activity of the glands of the skin and cause perspiration. Hot baths of air, vapor, or water are

among the best means for accomplishing this. Spirit of Mindererus (solution of acetate of ammonia), sweet spirit of nitre (spirit of nitric ether), and alcoholic drinks will cause sweating by increasing the flow of blood to the skin, while tartar-emetic, ipecac, aconite, and veratrum viride do it by relaxing the blood-vessels of the skin.

Forms in which Medicines are Prepared.

Infusions are generally made by pouring a pint of boiling water upon a definite amount of the drug; the seeds, bark, or roots having first been coarsely powdered, or pounded so as to break up their woody fibres. After standing, covered, until cool, the fluid portion is to be strained off. As a rule infusions will keep for only two or three days, and are better when freshly made from day to day. The dose is generally one to two wineglassfuls. The proportions of the drugs are mentioned below.

Two drachms to the pint:

Cloves.	Digitalis leaves.	Quassia chips, etc.

A half troy ounce to the pint:

Chamomile flowers.	Hops.	Pink root.
Calumbo root.	Flaxseed (whole).	Valerian leaves.
Red pepper.	Rhubarb root.	Ginger root.
Catechu gum.	Persimmon bark.	Mints of all kinds.
Gentian root.	Sage leaves.	Oak-bark, etc.
	Snake root (Virginia).	

One troy ounce to the pint:

Buchu leaves.	Boneset tops.	Tar (tar-water).
Cascarilla bark.	Juniper berries.	Wild cherry bark.
Peruvian bark.	Rhatany root.	Senna leaves, etc.
	Pareira root.	

Two troy ounces to the pint: Dandelion root, etc.

Decoctions are nearly all made by adding a troy ounce of the drug to a pint of water and boiling it slowly for a half-hour; allow it to cool and then strain off the fluid. Pour through the drug, in the strainer, enough water to make a pint of the fluid.

Tinctures.—These are among the most commonly used forms in which medicines are prepared; the advantage being that the alcohol used to extract the active elements of the drugs serves to

prevent, in most cases, any subsequent change in their properties. Moreover, these solutions are commonly so concentrated that they can be combined and administered with greater ease than in the case of the foregoing preparations. *As a rule* it will be better to make them of fresh plants, and for this purpose one part (by weight) of the plant (having been cut or pounded in the case of barks, roots, or seeds) may be placed in two parts of strong alcohol, in a stoppered bottle, or other closed vessel, where it is to be allowed to remain for a week, stirring or shaking it frequently. At the end of this time the fluid should be strained off, and the remaining drug be squeezed as dry as possible—a press of some kind being desirable for this purpose when it can be had. A clean rubber clothes-wringer is not a bad arrangement for accomplishing this in some cases. If it is desired that the tinctures should be clear, they may be filtered through a paper-cone placed in a funnel.

Tinctures made from dried substances are so variable in the proportions of their ingredients that they had better be obtained in all cases from an apothecary.

Ointments and **Cerates** are mixtures of medicinal substances with fats or similar bodies. This is generally done by rubbing them together cold, or by melting them with a heat just sufficient to liquefy them, and stirring them until cool. Cerates are of firmer consistence than ointments, usually owing to their containing wax.

Fluid Extracts are of the nature of concentrated tinctures.

Vinegars are solutions of drugs, made with diluted acetic acid, instead of water or spirit.

Medicated Waters are solutions of essential oils, gases, etc., in water.

Confections are made with sugar, honey, or similar substances as a basis. They are occasionally used by themselves as medicines—as in the case of confection of senna, others are used to incorporate with other substances, as aromatic confection, confection of orange-peel, confection of roses, etc.

Plasters are mixtures of medicinal substances with some adhesive body—like resin, oil, Burgundy pitch, India rubber, etc., which enables them to hold to the skin. Some of them, like diachylon and belladonna plasters, are to be had of apothecaries in the form of a cylindrical mass which can be spread, with a warm knife, on pieces of kid, wash-leather, or cloth as they are needed.

Solid Extracts, or, more properly, semi-solid extracts are among the most concentrated of vegetable extracts, and are used for

the preparation of pills, suppositories, plasters, ointments, etc., where fluids would not be admissible.

Glycerites are solutions of certain substances in glycerin. Their number is limited, and they are chiefly used for making gargles for sore mouths and throats, or for application to the skin. Among the former are glycerites of borax, of carbolic acid, and of tannin. Glycerite of starch is used for making pills, and glycerite of tar is of service in some skin diseases.

Liniments are intended for external use only, and, owing to the nature of their ingredients, are often poisonous when taken internally. When used to relieve pain they contain some anodyne, as belladonna, aconite, or opium. When a stimulating effect is desired, ammonia, capsicum, chloroform, turpentine, cantharides, camphor, etc., are added. The Carron-liniment is of service as a coating for burns. When it is desired to drive away swellings, oily substances are used in order to prevent the skin being irritated by prolonged rubbing.

Pills are of the most variable and complicated character. They are not, as many persons suppose, always intended to affect the bowels, but are used to administer substances in concentrated form; when their effect is not intended to be rapid; when it is desired to avoided unpleasant flavors, and as matters of convenience, since they enable the dose to be accurately measured and can easily be carried in the pocket. To cover their taste or to protect their contents from the action of the air, they are often covered with a thin, soluble varnish or a coating of sugar, extract of licorice, or silver leaf.

Powders consist either of the drug itself, finely ground, or its active principles mixed with sugar of milk or some other substance that enables it to be finely divided. Occasionally, as in the case of Dover's powder—made with opium, ipecac, and sulphate of potash—the substance added (sulphate of potash in this instance) has no particular medicinal value, but by its gritty nature it serves to grind the woody fibre of the other substances.

Suppositories are intended for the administration of medicines by the bowel. They are most commonly made with the oil or "butter" of cacao, which is solid at ordinary temperatures, but melts with the heat of the body. They should, therefore, be kept in a cool place. Gelatin is sometimes used as a basis instead, but is apt to become practically insoluble when long kept.

Syrups are solutions of medicinal substances in water, the sugar serving either to improve their flavor or to protect them from changes due to exposure to air, as in the case of preserved fruits.

Lozenges or **Troches** are used on account of the facility with which doses can be divided and carried; for the sake of the agreeable form in which they can thus be administered, and especially for remedies used in diseases of the throat, when, by their gradual solution in the mouth, their ingredients are brought for some time in contact with the diseased surface.

Wines are practically weak tinctures made with wine—usually sherry. They are especially useful in the preparation of substances that are not so soluble in alcohol as in water: but when the presence of a small proportion of the latter prevents the drug from spoiling with keeping. Their more agreeable flavor is also a reason for their use.

FORMULAS.

Freezing Mixtures.

Sal ammoniac, 5 parts; nitrate of potash, 5 parts; water, 16 parts; or:

Sal ammoniac, 5 parts; nitrate of potash, 5 parts; Glauber's salt, 8 parts; water 16 parts; or:

Glauber's salt, 6 parts; sal ammoniac, 4 parts; nitrate of potash, 2 parts; dilute nitric acid, 4 parts.

Either of the above is said to cause a fall of mercury in the thermometer, from 50° to 10°.

Evaporating Lotions.

Muriate of ammonia, 24 grains; alcohol, 72 minims; water, 2 ounces. Or, alcohol, bay rum, or cologne, 1 part; water, 8 parts.

Used with thin muslin or linen as an application to inflamed surfaces.

Poultices.

Charcoal.—Soak 2 ounces of bread crumbs in 10 ounces of boiling water for ten minutes. Mix them and stir in ½ ounce of pulverized wood charcoal and 1½ ounce of linseed meal. Spread on a cloth in the usual way and, just before applying, sprinkle the surface with powdered charcoal.

Mustard.—Enough mustard flour to form a poultice of the desired size should be stirred to break up any lumpy masses; then add enough boiling water to make a paste, which should be spread on muslin or paper, and be covered with thin gauze.

Flaxseed.—See page 861.

Bread and Milk.—*Never* make it with milk, but use hot water. Milk becomes quickly sour and causes irritation of the surface to which it may be applied.

Break the soft part of bread into lumps about an inch in size, and put into a *hot* flat dish or basin. Pour on boiling water and cover the whole with a plate. *Do not stir*

it! When the crumb has become soft, strain off any surplus water, turn the poultice into a cloth, which should be folded as directed on page 862, and covered with oiled-silk or flannel. Keep it as light and porous as possible.

Slippery Elm.—Having broken up any lumps of powdered slippery elm bark, add enough boiling water to make a mass of proper consistence. This poultice has the disadvantage of sticking tightly to hairs, as it becomes dry, and of becoming stiff and irritating as it loses its moisture; for these reasons its surface should be oiled (with cosmoline, vaseline, or suet), and it should be well covered with oiled-silk or flannel.

Okra.—The fruit of the "okra" or gombo, being bruised, makes a very soothing mucilaginous *cold* poultice.

Carbolized Oil.

Carbolic acid, 1 part; olive (or cotton-seed) oil, 10 parts.

Enemas (*Clysters*).

Soap.—Castile-soap scraped fine, ½ ounce; hot water, 2 pints. Mix thoroughly.

Assafœtida.—Tincture of assafœtida, 2 drachms; barley water, ¾ pint. Mix, and use for flatulence and "nervousness."

Turpentine.—Spirit of turpentine, 1 ounce; the yelk of 1 egg. Rub them well together as in making a salad-dressing. Then add gradually 1 pint of barley-water or thin gruel.

Liniments.

Chloroform.—Chloroform, 3 parts; cotton-seed oil, 4 parts. Mix them.

Soap.—Soap, in shavings, 10 parts; camphor, 5 parts; oil of rosemary, 1 part; water, a sufficient quantity; alcohol, a sufficient quantity.

Place the soap in 16 parts of the water and allow it to remain until dissolved. Dissolve the camphor and the oil in 70 parts of alcohol. Mix the two and filter.

Hartshorn.—Mix 1 part of water of ammonia with 2 parts of cotton-seed oil (or sweet oil) by shaking them in the bottle.

Camphor.—Camphor, 1 part; cotton-seed oil, 4 parts. Allow the camphor to dissolve before use.

Turpentine.—Resin cerate, 2 parts; oil of turpentine, 1 part. Melt the cerate with gentle heat; add the oil gradually, and stir them until thoroughly mixed.

Carron Oil or Liniment.

Equal parts of lime water and sweet oil, well shaken together, forms a creamy emulsion which is a soothing application for fresh burns. It should be applied on cotton batting.

Glycerite of Tannin.

Tannic acid, 1 part; glycerin, 5 parts. Mix. Useful for application to inflammations of the skin and to piles; and, mixed with 3 parts of water, as a gargle for sore throat and as a mouth-wash.

Barley Water.

Pearl barley, 1 part; wash with cold water, then boil it with 4 parts of fresh water for five minutes and throw away the liquid portion. Put it into 30 parts of cold water, boil it down to one-half and strain.

Lime Water.

Fresh lime, 1 part, slake it by pouring on 1 part of boiling water, then add 30 parts of cold water (pure) and stir it occasionally for a half hour. Allow it to stand for one

hour; gently pour off the water and throw it away. Add again 30 parts of water, stir it well, and after allowing the coarser particles of lime to settle, pour off the mixture into a clean bottle and let it stand until clear. Pour off the clear water, as wanted.

Cough Mixture.

Acetate of morphia, or sulphate of morphia, 2 grains; wine of antimony, ½ ounce. Mix them and add powdered gum tragacanth and powdered sugar, of each 1 drachm. Rub them in a mortar with water, 8 ounces. Dose, a tablespoonful (for adults or large children *only*) every three hours. Chiefly of use in the early stage of a catarrhal cough.

Another Cough Mixture (*Brown Mixture*).

Extract of licorice, powdered gum-arabic, and powdered sugar, of each 3 parts; paregoric, 12 parts; wine of antimony, 6 parts; spirit of nitrous ether, 2 parts; water, 71 parts. Rub the licorice, sugar, and gum with the water in a mortar (adding the water slowly), then add the other ingredients and mix the whole thoroughly. Dose for an adult, 2 to 4 teaspoonfuls every 4 to 6 hours; for a child, a teaspoonful. Useful in the advanced stage of a cold.

Rhubarb and Soda Mixture.

Bicarbonate of soda, 1 drachm; powdered rhubarb, ½ ounce; spirit of peppermint, 2 drachms; water, enough to make 4 fluid ounces.

Teaspoonful doses for children are serviceable in correcting summer bowel-disturbances with sour-smelling stools.

Diarrhœa Mixture (*Squibb's*).

Tincture of opium, 1 fluid ounce; tincture of capsicum, 1 fluid ounce; spirits of camphor, 1 fluid ounce; chloroform, 3 fluid drachms; alcohol, enough to make 5 fluid ounces. Mix. Give 20 to 40 drops with a little hot water after every movement of the bowels. Chiefly useful in summer diarrhœa of *adults*.

Pills of Tannic Acid and Opium.

Tannic acid, one drachm; opium, five grains; confection of roses, sufficient. Make into twenty pills. Take one every 6 hours in *chronic* diarrhœa and in prolonged bleeding from the bowel or womb. Should not be given to children.

Seidlitz Powder.

Tartrate of soda and potassa, 2 drachms; bicarbonate of soda, 40 grains. Mix them thoroughly and dissolve in ½ glass of water. In another large glass, not quite half full, dissolve 35 grains of tartaric acid, and then pour this into the contents of the first glass. Drink it while effervescing.

An agreeable saline and cooling laxative.

Hair Restorer.

Cantharadin, 1 grain; acetic ether, 2 drachms; rectified alcohol, 3 ounces; castor oil, 1 ounce; oil of lavender, or of rosemary, 15 drops. To be mixed and rubbed lightly on the head when the hair is falling, or even on places already bald. It should be washed off if it causes too much irritation.

Tooth-powder of Rhatany, etc.

Extract of rhatany, 1 or 2 drachms; myrrh, 1 drachm; powdered orris root, 6 drachms; oil of cinnamon, 2 drops; oil of myrrh, 10 drops; balsam of Peru, 10 grains. Mix well. Serviceable for tender or sore gums.

Cold Cream.

Oil of sweet almonds, 2 ounces; spermaceti, ½ ounce; white wax, 1 drachm; rose-water, 1 ounce. Melt the ingredients by stirring them in a white porcelain pot placed in boiling water. When they are well melted remove the pot from the boiling water, add 1 ounce of rose-water and continue the stirring until the whole is cool.

Dover's Powder (*modified by Dr. Piffard*).

Ipecac, in fine powder, 1 part; opium, dried and in fine powder, 1 part; sugar of milk, in moderately coarse powder, 8 parts. Rub them together in a mortar into a fine powder.

Every 10 grains contains 1 grain of opium, which is the dose for an adult. Should not be used for children except with a doctor's directions.

Tully's Powder.

Sulphate of morphia, 1 part; camphor, powdered licorice root, precipitated chalk, of each 20 parts; alcohol sufficient.

Grind the camphor to powder in a mortar with the aid of a few drops of alcohol. Rub with this the chalk and licorice root, and when they are well mixed add the morphia with a small amount of the foregoing, adding the balance slowly until the whole is thoroughly mixed.

This is largely used in place of the "Dover's Powder," owing to the absence of ipecac in its composition.

Compound Rhubarb Pills.

Powdered rhubarb, 4 drachms; powdered aloes, 3 drachms; powdered myrrh, 2 drachms; soft soap (apothecary's), ½ drachm; oil of peppermint, 15 minims. Beat up into an uniform mass with a small amount of water, and divide into 200 pills, two to four of which serve as a laxative of somewhat greater activity than the following.

Compound Powder of Licorice.

Senna, in fine powder; licorice root, in fine powder, of each 2 parts; fennel, in fine powder; washed sulphur, of each 1 part; sugar, in fine powder, 6 parts. Rub them together until thoroughly mixed. A teaspoonful, taken with ½ glass of water, is an excellent laxative.

Compound Tincture of Benzoin (*Friar's Balsam*).

Benzoin, in powder, 3 ounces; socotrine aloes, in powder, ½ ounce; storax, 2 ounces; balsam of tolu, 1 ounce; alcohol, enough to make 2 pints. Put them together into a bottle and allow them to stand for several days. A good dressing for cuts.

GLOSSARY.

N.B.—See also the INDEX, and WORCESTER'S or WEBSTER'S Dictionaries.

Abnormal, contrary to the natural.
Achromatic, without color.
Adjuvants, medicines which aid the action of others.
Adynamic, without power.
Ague-cake, enlarged spleen.
Algid, cold.
Alveoli, teeth-sockets, or little cavities.
Alvine, relating to the belly—such as alvine discharges, or fæces.
Amenorrhœa, absence of the menstrual flow.
Amorphous, without form, usually applied to substances that are not crystalline.
Anæmia, without blood.
Anchylosis, rigidity of joints.
Angina maligna, malignant sore-throat.
Anhydrous, without water.
Anodynes, medicines that relieve pain.
Anomalous, not according to rule.
Anthelmintics, remedies that cause expulsion of worms.
Anti, against.
Antidote, a remedy which counteracts the effects of poisons or diseases.
Antiperiodics, remedies which relieve periodical diseases—such as ague.
Antiscorbutics, articles of food that prevent scurvy.
Aperients, remedies which relax the bowel.
Aphonia, absence of voice.
Apnœa, want of breath.
Aqua fortis, nitric acid.
Aqua regia, a mixture of equal parts of nitric and hydrochloric acids.
Areola, a circle of color such as surrounds a nipple or a point of inflammation.
Arthritic, relating to a joint.
Articulation, point of union between bones.
Ascites, dropsy of the belly.
Asphyxia, suffocation.
Asthenia, weakness, want of strength.
Astringent, puckering, contracting.
Atonic, want of tone.
Atrophy, emaciation, wasting.
Auditory, relating to the sense of hearing or the ear.

Bilateral, on both sides.
Bistouri, a small knife.
Blennorrhagia, a discharge of mucus.
Bluestone, sulphate of copper.
Bolus, a large pill.
Bougie, an instrument used for dilating narrowed passages.
Bursa, a purse, applied to enlarged sheaths of sinews.

Cachexia, a derangement of general health depending upon some constitutional disease.
Calculus, a stone.
Calvarium, the upper portion of the skull.
Canthus, the angle formed by the union of the eyelids.
Capillary, hair-like.
Caries, ulceration of bone.
Carminatives, medicines that relieve flatulence and colic. (From *carmen*—a charm.)
Carpus, the wrist.
Catalysis, a form of decomposition produced by contact.
Catamenia, the menses.
Cautery, destruction by means of heat.
Cephalalgia, headache.
Cerebellum, the little brain.
Cerebral, pertaining to the brain.
Cerebrum, the upper part of the brain.

Cerumen, wax.
Cervix, neck.
Chalybeates, medicines containing iron.
Charpie, ravelled lint.
Chin-cough, whooping-cough.
Chlorosis, green-sickness.
Cholagogues, medicines that increase the discharge of bile.
Chorea, St. Vitus's dance.
Chylopoietic, relating to the digestive organs.
Chymification, conversion of fatty food into chyme, or an emulsion.
Climacteric, the change or critical period of life.
Clinical, bedside.
Clonic, applied to intermittent spasms.
Clyster, an enema.
Coagulum, clot.
Collapse, sudden failure of vitality.
Colliquative, excessive discharge—applied to perspiration or movements of the bowel.
Colloid, jelly-like.
Collyrium, an eye-wash.
Coma, profound unconsciousness.
Condyle, side-projections of joints.
Congenital, from birth.
Congestion, overfulness of blood-vessels.
Contagion, the communication of disease from one person to another.
Contagious, capable of being communicated from one person to another.
Convalescence, the stage of recovery from illness.
Copperas, sulphate of iron.
Coryza, catarrh of the cavity of the nose.
Cranium, the skull.
Cretinism, a form of idiocy accompanying goitre.
Crisis, a period in disease when a change is liable to occur.
Cuticle, the surface skin.
Cutis, the true skin.

Dejections, the stools—fæces.
Demulcent, softening.
Diagnosis, the recognition of disease.
Diaphoretics, medicines which cause perspiration.
Diathesis, a state of the system peculiar to certain diseases.
Diuresis, increased flow of urine.
Diuretics, remedies which increase the activity of the kidneys.
Dorsal, pertaining to the back.
Dorsum, the back.
Dysuria, painful urination.

Ecchymosis, discoloration from a bruise, or rupture of blood-vessels.
Effusion, escape of fluid into unnatural localities.
Emmenagogues, remedies which promote the menses.
Emphysema, distention of tissues with air.
Empyema, collection of matter.
Endemic, belonging to a locality.
Entozoa, internal parasites.
Ephemera, transient fever.
Epidemic, when applied to disease, indicates one depending upon causes that do not belong naturally to the locality.
Epigastrium, the region commonly known as the "pit of the stomach."
Epistaxis, bleeding from the nose.
Epithelium, the superficial layer of skin, or of mucous or serous membranes.
Erethism, excitement.
Escharotics, substances which destroy the tissues when applied to them—such as the mineral acids, arsenic, etc.
Etiology, the doctrine of causes.
Exanthem, an eruption—applied to diseases of the skin.
Excoriated, raw.
Extra, without (outside of).
Extravasation, escape of blood or fluid out of their proper vessels or cavities into unnatural situations.
Exudation, oozing of fluid—applied also to products of inflammation.

Fæces, excrement.
Fascia, a broad tendinous membrane.
Fauces, back part of throat.
Febrile, pertaining to fever.
Fluor albus, whites, leucorrhœa.
Follicle, a tube-shaped gland.
Fomites, matters containing the contagious elements of disease.
Fontanelle, an opening between the adjoining bones of the skull of infants.

Foramen, an opening (generally referring to bones).
Fungus, morbid growths of rapid development.

Galactorrhœa, excessive milk-flow.
Ganglion, an isolated mass of gray nerve-substance; also an enlarged tendinous sheath.
Gangrene, mortification or death of soft tissues.
Gastric, relating to the stomach.
Genu, knee.
Globus hystericus, hysteric ball—a sensation of a ball rising in the throat.
Glottis, the opening from the throat into the air-tubes.

Hemicrania, pain on one side of the head.
Hepar, liver.
Hepatic, relating to the liver.
Hydatid, a small bladder.
Hydrops, dropsy.
Hyperæsthesia, excessive sensitiveness.
Hypertrophy, overgrowth.
Hypnotic, a medicine which produces sleep.
Hypodermic, beneath the skin.

Icterus, jaundice.
Idiopathic, primary; not depending upon another disease.
Idiosyncrasy, individual peculiarity.
Inanition, want of food.
Incubation, hatching.
Infection, communication by contact.
Infra, below.
Inguinal, relating to the groin.
Insomnia, sleeplessness.
Intermittent, recurring at intervals.
Intra, within.
Itis, when added to the name of a locality or organ, signifies an inflammation of it.

Julep, an aromatic drink.

Labia, lips.
Lac, milk.
Lactation, suckling.
Lachrymæ, tears.
Lacteals, lymph-vessels connected with the intestine.
Lamina, a layer.
Laryngotomy, opening the wind-pipe.
Lateral, on one side.
Lesion, hurt, breach of substance, injury.
Lethargy, unconsciousness.
Leucorrhœa, whites.
Lienteric, consisting of undigested food.
Lithontriptic, medicines supposed to be capable of dissolving stone.
Lithotomy, operation for stone by cutting.
Lobe, a distinct division or portion of an organ.
Lochia, discharges which occur after childbirth.
Lumbar, relating to the loins.
Lymph, fluid contained in the lymphatic vessels.

Malaria, bad air.
Mamma, a breast.
Matrix, the uterus.
Melæna, black-vomit.
Meninges, membranes covering the brain.
Menstruum, fluid serving to hold substances in admixture or solution.
Metamorphosis, change of form.
Metastasis, shifting.
Metritis, inflammation of the uterus.
Miasm, poisonous gases.
Morbilli, measles.
Moribund, near death.
Mortification, death of soft tissues.
Motility, the capacity for movement.
Muscæ volitantes, floating specks.

Narcotism, the effect of narcotics.
Naris, a nostril.
Nates, buttocks.
Necrosis, death of bone.
Nephralgia, kidney-pain.
Nephritic, relating to the kidneys.
Neuralgia, nerve-ache.
Neurosis, nerve-disease.
Node, a lump.
Normal, natural, regular.
Nostalgia, home-sickness.
Nostrum, a secret preparation.
Nucha, nape of the neck.

Obstetric, relating to childbirth.
Occiput, back of the head.
Œdema, dropsical swelling.
Œdematous, dropsical.
Oil of vitriol, crude sulphuric acid.
Olfactory, relating to smell.

Omentum, the caul.
Onychia, a felon.
Ophthalmic, relating to the eye.
Ossification, conversion into bone.
Ovariotomy, removing an ovary.
Ovum, an egg.

Panacea, a remedy for all things.
Paracentesis, puncture.
Paralysis, loss of power.
Parietes, walls.
Paroxysm, period of attack.
Pathognomonic, distinguishing symptom.
Pectoral, relating to the chest.
Pedicle, stalk.
Pediluvium, a foot-bath.
Pellicle, a film.
Petechiæ, spots like flea-bites.
Phagædena, a spreading ulcer.
Pharynx, back of the mouth.
Phlebitis, inflammation of veins.
Phlebotomy, bleeding by opening a vein.
Phlegmasia dolens, painful swelling, applied to an enlargement of the lower extremities most frequent after childbirth.
Phlegmon, a localized inflammation, as a boil.
Phlegmonous, inflammatory.
Plethora, overfulness, applied usually to blood-vessels.
Pleurodynia, pain in the side.
Plexus, a net-work.
Podagra, gout.
Polypus, a tumor attached to the surface from which it originated by a narrower portion, termed a *pedicle*.
Post-mortem, after death.
Primæ viæ, stomach and intestine.
Process, a bony prominence.
Prognosis, prediction.
Prolapsus, falling.
Prophylactic, preventive.
Pruritus, itching.
Pseudo, false.
Psychology, the study of mind.
Ptyalism, excessive flow of saliva.
Puerperal, belonging to childbirth.
Pulmonary, relating to the lungs.
Pyrexia, fever.

Ranula, a tumor below the tongue.
Regurgitate, to belch up, the opposite of swallowing.
Remittent, of variable intensity.
Rheum, catarrh.
Rigor, shivering

Sanguis, blood.
Sanies, a watery discharge from sores.
Sciatica, neuralgia in the hip and thigh.
Scirrhus, hard.
Sclerosis, hardening.
Sedatives, medicines which diminish activity.
Semeiology, relating to symptoms.
Senile, old.
Sensorium, seat of consciousness.
Sequelæ, results, effects.
Serum, the fluid which separates from the clot when blood coagulates.
Sialagogues, medicines which increase the flow of saliva.
Slough, the layer of dead flesh which separates from a wound.
Sopor, sleep.
Sphincter, a ring-like muscle.
Sporadic, occasional.
Sputum, expectorated matter.
Stertor, snoring.
Strangulated, choked.
Stupor, insensibility.
Subcutaneous, under the skin.
Sudorifics, remedies that cause sweating.
Synchronous, acting together.
Syncope, fainting, swooning.

Tabes, wasting.
Tenesmus, straining at stool.
Tetanus, rigidity of the muscles.
Thorax, chest.
Tic-douloureux, a sudden and severe form of neuralgia of the face.
Traumatic, resulting from injury.
Trismus, rigidity of the muscles of the jaw.

Velum, a curtain.
Venter, the belly.
Ventral, belonging to the belly.
Vesication, blistering.
Virus, poison.
Viscus, an internal organ.
Viscera, the plural of *viscus*.
Vomica, a cavity, applied to the lungs.

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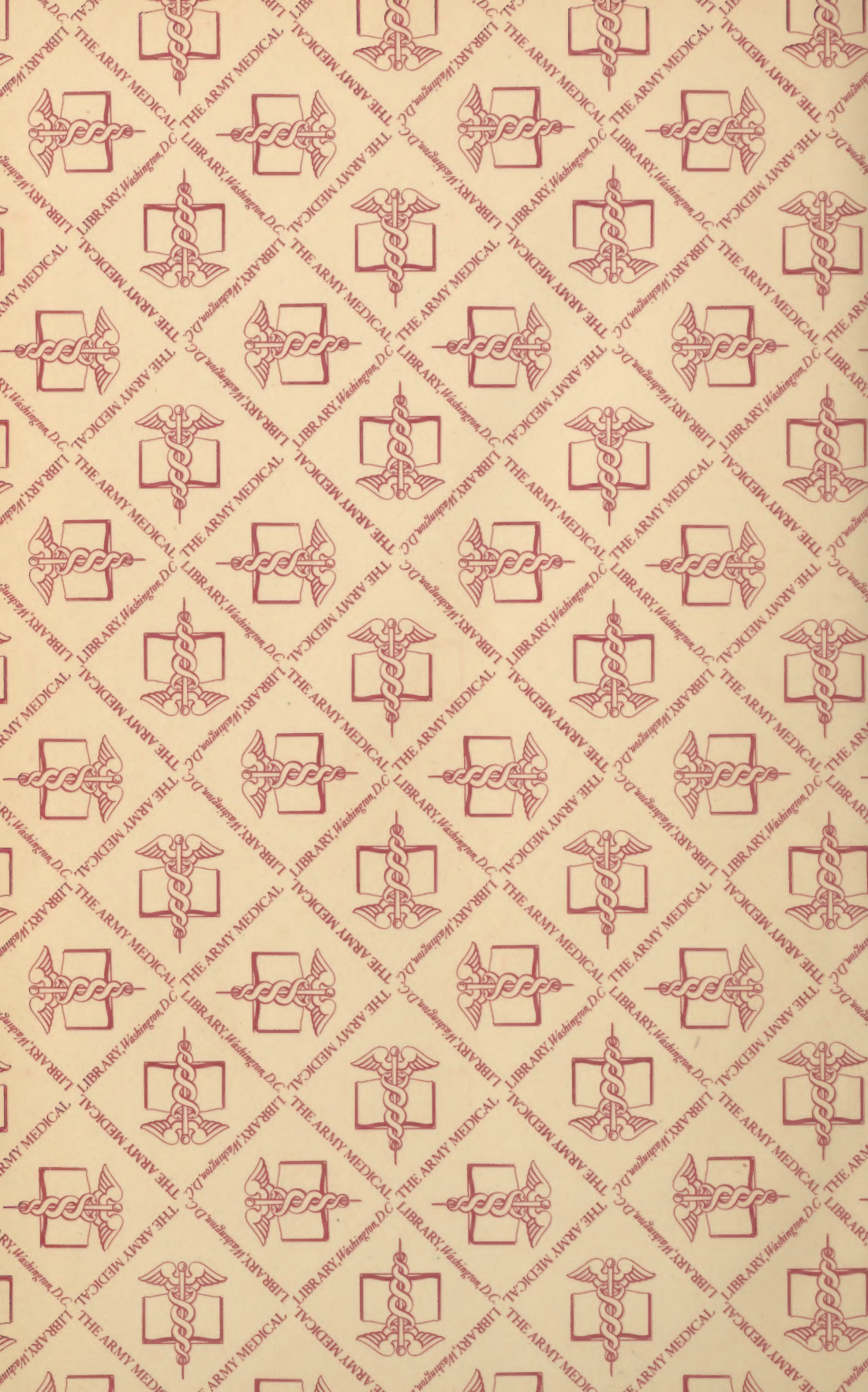
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